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# COLUMBIAN UNIVERSITY BULLETIN

MARCH, 1904

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JUNE, OCTOBER, AND DECEMBER.



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COLUMBIAN UNIVERSITY BULLETIN

MARCH 1904



THE UNIVERSITY OF THE DISTRICT OF COLUMBIA  
LIBRARY

## CONTENTS.

	Page
University Calendar.....	v
Governing Board, Trustees.....	vii
Standing Committees of Trustees.....	viii
Board of Visitors, Department of Jurisprudence and Diplomacy.....	viii
Alumni Association.....	ix
Officers.....	x
President's Council.....	x
University Council.....	xi
Educational Advantages of Washington.....	1
Department of Arts and Sciences.....	9
Admission.....	12
University Subjects.....	26
Requirements for Degrees.....	67
Schedule of Recitations.....	76
Higher Degrees.....	78
Fees.....	88
Teachers' Courses.....	105
Department of Medicine.....	108
Admission.....	113
Courses of Instruction.....	115
Fees.....	133
Ordinance for Department of Public Health.....	142
Department of Dentistry.....	143
Courses of Instruction.....	145
Fees.....	151
Department of Law.....	155
Admission.....	157
Courses of Instruction.....	159
Graduate Course.....	163
Fees.....	167
Department of Jurisprudence and Diplomacy.....	183
Admission.....	186
Courses of Instruction.....	186
Doctors of Philosophy, Degrees Conferred 1894-1903.....	201
University Athletics.....	204
Directory.....	205
Index.....	209

1904.

JANUARY.

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## UNIVERSITY CALENDAR.

1904.

- Jan. 30, *Saturday*.—Mid-Year Examinations completed in the Department of Arts and Sciences.
- Feb. 1, *Monday*.—Second Term begins.
- Feb. 22, *Monday*.—Washington's Birthday; a holiday.
- March 19, *Saturday*.—Annual meeting of the Alumni Association.
- April 1-4, *Friday to Monday*, both inclusive.—Easter holidays.
- April 6, *Wednesday*.—Davis Prize Speaking.
- May 2, *Monday*.—Last day on which Theses may be presented.
- May 11, *Wednesday*.—Examinations for Degrees completed.
- May 23, *Monday*.—Doctorate Disputation.
- May 29, *Sunday*.—Baccalaureate Sermon.
- May 27-31, *Friday to Tuesday*.—Examinations for admission to the Department of Arts and Sciences.
- May 30, *Monday*.—Commencement of the Departments of Medicine and Dentistry.
- May 31, *Tuesday*.—Final Examinations completed and session closed in the Department of Arts and Sciences.
- May 31, *Tuesday*.—Commencement of the Departments of Law, Jurisprudence and Diplomacy.
- June 1, *Wednesday*.—Commencement of the Department of Arts and Sciences.

### SUMMER VACATION.

- Sept. 23-27, *Friday to Tuesday*.—Examinations for Admission to Department of Arts and Sciences.
- Sept. 26, *Monday*.—Fall Examinations in the Departments of Medicine and Dentistry.
- Sept. 28, *Wednesday*.—Academic Year Begins in Department of Arts and Sciences.
- Sept. 29, *Thursday*.—Academic Year begins in Departments of Medicine and Dentistry.
- Oct. 3, *Monday*.—Academic Year begins in Department of Law.
- Oct. 4, *Tuesday*.—Academic Year begins in Department of Jurisprudence and Diplomacy.
- Nov. 24-26, *Thursday to Saturday*, both inclusive.—Thanksgiving recess.

RECESS FROM DECEMBER 23, 1904, TO JANUARY 2, 1905, BOTH INCLUSIVE.

1905.

Jan. 31, *Tuesday*.—Mid-Year Examinations completed in the Department of Arts and Sciences.

Feb. 1, *Wednesday*.—Second Term begins.

Feb. 22, *Wednesday*.—Washington's Birthday; a holiday.

Feb. 25, *Saturday*.—Annual Meeting of the Alumni Association.

March 4, *Saturday*.—Inauguration Day; a holiday.

April 21-24, *Friday to Monday*, both inclusive.—Easter holidays.

April 26, *Wednesday*.—Davis Prize Speaking.

May 1, *Monday*.—Last day on which Theses may be presented.

May 10, *Wednesday*.—Examinations for Degrees completed.

May 22, *Monday*.—Doctorate Disputation.

May 28, *Sunday*.—Baccalaureate Sermon.

May 26-30, *Friday to Tuesday*.—Examinations for admission to the Department of Arts and Sciences.

May 29, *Monday*.—Commencement of the Departments of Medicine and Dentistry.

May 30, *Tuesday*.—Final Examinations completed and session closed in the Department of Arts and Sciences.

May 30, *Tuesday*.—Commencement of the Departments of Law, Jurisprudence and Diplomacy.

May 31, *Wednesday*.—Commencement of the Department of Arts and Sciences.

## GOVERNING BOARD.

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WILLIAM AUGUSTIN DE CAINDRY, Auditor.	CHARLES WENDELL HOLMES, Assistant Treasurer.

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President of the University and *ex Officio* Member of the Board.

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#### *Trustees Whose Term Expires in 1906.*

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THEODORE W. NOVES, LL. M.	DAVID ABBOT CHAMBERS, A. M.
ANDREW J. MONTAGUE, LL. D.	CHARLES D. WALCOTT, LL. D.
CHARLES WILLIAMSON RICHARDSON, M. D.	

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1904-1905.

*Executive:* WOODWARD (Chairman), GREENE, MATTINGLY, LARNER,  
GALLAUDET, EDSON, WALCOTT, and NEEDHAM.

*Nominations:* GREENE, WOODWARD, LEVERING, GALLINGER.

*Department of Arts and Sciences:* NOYES, GALLAUDET, MACFARLAND.

*Department of Medicine and Hospital:* LARNER, EDSON, RICHARDSON.

*Department of Dentistry:* SHALLENBERGER, JONES, RICHARDSON.

*Department of Law:* MATTINGLY, LARNER, MONTAGUE.

*Department of Jurisprudence:* MACVEAGH, MATTINGLY, LARNER.

*Auditing:* JONES, CHAMBERS, PARKER.

*Endowment:* GALLAUDET, LEVERING, WOODWARD, GREENE, MACVEAGH,  
PARKER, NOYES, MATTINGLY, EDSON, LARNER, CHAMBERS,  
SHALLENBERGER, GALLINGER, MACFARLAND.

---

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DIPLOMACY.

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Hon. JOHN HAY, LL. D., Secretary of State.

Hon. LYMAN J. GAGE, LL. D., Formerly Secretary of the Treasury.

Hon. HENRY B. BROWN, LL. D., Associate Justice of the Supreme Court  
of the United States.

Hon. CHAUNCEY M. DEPEW, LL. D., U. S. Senator from New York.

Hon. JOHN F. DILLON, LL. D., Formerly Judge of the Circuit Court of  
the United States.

Hon. WILLIAM LINDSAY, LL. D., Formerly U. S. Senator from Kentucky.

Hon. FRANK A. VANDERLIP, Formerly Assistant Secretary of the  
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WILLIAM ALLEN WILBUR, A. M.,  
Corresponding Secretary of the University.  
CHANNING RUDD, D. C. L.,  
Registrar of the University.

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Dean of the Department of Dentistry.  
HENRY ST. GEORGE TUCKER, LL. D.,  
Dean of the Departments of Law, Jurisprudence and  
Diplomacy.

## ALUMNI ASSOCIATION.

An address list of all graduates is kept at the University by the Secretary of the General Alumni Association. All Alumni are requested to send to him notices of changes in address and any other items of information in reference to graduates or former students of the University.

### THE GENERAL ASSOCIATION.

OFFICERS, 1904.

*President.*

WILLIAM BRUCE KING.

*Vice-Presidents.*

DR. GEORGE N. ACKER.

JOHN JOY EDSON.

ALDIS B. BROWNE.

THEODORE W. NOYES.

JOHN PAUL EARNEST.

EDWARD J. STELLWAGEN.

*Secretary.*

HOWARD L. HODGKINS

*Treasurer.*

JOHN B. LARNER.

*Executive Committee.*

WILLIAM BRUCE KING, Chairman.

HOWARD L. HODGKINS, Secretary.

DR. GEORGE N. ACKER.

JOHN B. LARNER.

DR. C. W. APPLER.

DR. T. N. McLAUGHLIN.

ALDIS B. BROWNE.

DR. J. RAMSEY NEVITT.

WILLIAM A. DECAINDRY.

THEODORE W. NOYES.

JOHN T. DOYLE.

STANTON C. PELLE.

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EDWARD J. STELLWAGEN.

JOHN JOY EDSON.

ALEXANDER T. STUART.

J. W. HOLCOMBE.

DR. HENRY C. THOMPSON.

BRAINERD H. WARNER.

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Professor of Architecture.
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Professor of Zoölogy.
- FRANK HAGAR BIGELOW, A. M., L. H. D.,  
Professor of Astro-Physics.
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Assistant Professor of the Law of Torts, Personal Property, and Domestic Relations.
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Professor of Bankruptcy and Insolvency.
- DAVID J. BREWER, LL. D.,  
Professor of International Public Law.
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Professor of Physiology and Professor of Clinical Surgery.
- MITCHELL CARROLL, Ph. D.,  
Head Professor of Classical Philology.
- MELVILLE CHURCH, LL. M.,  
Professor of the Law of Patents.
- FRANK WIGGLESWORTH CLARKE, Sc. D.,  
Professor of Mineral Chemistry.
- THOMAS A. CLAYTOR, M. D.,  
Professor of Materia Medica and Therapeutics and Professor of Clinical Medicine.
- WALTER C. CLEPHANE, LL. M.,  
Professor of Equity Pleading and Practice, Organization of Corporations, and Judge of Moot Court.
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Professor of Botany.
- WILLIAM P. CUTTER, B. S.,  
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Professor of Diplomacy and Treaties of the United States.
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- JAMES HOWARD GORE, Ph. D.,  
Head Professor of Mathematics.
- JOHN MARSHALL HARLAN, LL. D.,  
Professor of Constitutional Law, Law of Domestic Relations, Torts, and Personal Property.
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Head Professor of Romance Languages.
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Professor of Common Law Pleading and Practice.
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Dean of Department of Dentistry and Professor of Dental Prosthetics.
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Professor of Astronomy.
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Professor of Clinical Medicine.
- HERMANN SCHOENFELD, Ph. D., LL. D.,  
Head Professor of German.
- D. KERFOOT SHUTE, A. B., M. D.,  
Dean *pro tempore* of the Department of Medicine and  
Professor of Anatomy, Clinical Ophthalmology, and  
Neurology.
- CHARLES S. SMITH, A. M.,  
Assistant Professor of Greek and Latin.
- JAMES MACBRIDE STERRETT, A. M., D. D.,  
Head Professor of Philosophy.
- CHARLES CLINTON SWISHER, Ph. D.,  
Head Professor of History, Professor of Political Science,  
and Professor of Comparative Politics.
- HANNIS TAYLOR, LL. D.,  
Professor of Common Law of England and of International  
Private Law.
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Professor of Operative Dentistry.
- J. FORD THOMPSON, M. D.,  
Professor of Surgery and Clinical Surgery.
- ERNEST LAWTON THURSTON, C. E.,  
Professor of Graphics.
- HENRY ST. GEORGE TUCKER, LL. D.,  
Dean of the Departments of Law, Jurisprudence and  
Diplomacy, and Professor of Equity Jurisprudence and  
Comparative Constitutional Law.

WILLIAM REYNOLDS VANCE, A. M., Ph D., LL. B.,  
Professor of Real Property, Contracts, Corporations, and  
Commercial Paper.

FRANK VAN VLECK, M. E.,  
Acting Professor of Mechanical Engineering.

WILLIAM ALLEN WILBUR, A. M.,  
Head Professor of English, Corresponding Secretary of the  
University.

HARVEY WASHINGTON WILEY, Ph. D., M. D.,  
Professor of Agricultural Chemistry.

FRANK A. WOLFF, Ph. D.,  
Professor of Electrical Engineering.

CARROLL D. WRIGHT, LL. D.,  
Professor of Statistics and Social Economics.

## Columbian University.

### EDUCATIONAL ADVANTAGES OF WASHINGTON.

COLUMBIAN UNIVERSITY in the City of Washington was chartered by Congress in 1821. It comprises the following departments :

DEPARTMENT OF ARTS AND SCIENCES.

[UNDERGRADUATE AND GRADUATE.]

DEPARTMENT OF MEDICINE.

DEPARTMENT OF DENTISTRY.

DEPARTMENT OF LAW.

DEPARTMENT OF JURISPRUDENCE AND DIPLOMACY.

An ordinance has been adopted by the Board of Trustees of the University creating a new department "for the purpose of graduate education in the subjects of preventive medicine and the fundamental and administrative laws pertaining to the prevention of diseases, epidemics, and injuries, which shall be designated as the Department of Public Health." The ordinance will go into effect when a sufficient endowment for this department has been secured.

An ordinance has likewise been adopted, subject to a similar condition with respect to endowment, creating a new Department of Bibliology and Library Science.

### Columbian University and the High-School System.

Washington is the natural centre for university studies based on the High-School system of the United States. Columbian University, in recognition of this fact, has reorganized its educational work in order to admit to its Department of Arts and Sciences the graduates of all approved high schools upon their certificates of graduation. This University begins the higher education with the student where the high school leaves him, and thus by correlating its work with the national system

of education it seeks a national constituency. The conditions of life in the national capital facilitate the growth of an educational institution that in organization and purpose and spirit embodies American ideas and ideals. Columbia University aims to be such an institution, offering undergraduate and graduate courses in the arts and sciences and courses of professional study in medicine, in dentistry, in law, in jurisprudence and diplomacy. The geographical distribution of Columbia students is an evidence of the national character and significance of the University. The geographical distribution of students enrolled for the academic year 1903-04 was as follows:

#### Geographical Distribution of Students.

Alabama .....	9	North Carolina.. ..	25
Arkansas .. ..	6	North Dakota .....	6
California.....	10	Ohio .....	57
Colorado.....	8	Oklahoma.....	6
Connecticut .....	13	Oregon.....	6
Delaware .....	2	Pennsylvania .....	84
District of Columbia.....	399	Philippine Islands.....	3
Florida .....	5	Porto Rico .....	3
Georgia .....	11	Rhode Island .....	2
Hawaii .....	1	South Carolina.....	12
Idaho .....	5	South Dakota.....	13
Illinois .....	46	Tennessee .....	14
Indiana .....	30	Texas .....	22
Iowa .....	23	Utah .....	8
Kansas .....	21	Vermont.....	0
Kentucky .....	25	Virginia.....	90
Louisiana .....	9	Washington.....	6
Maine .....	8	West Virginia .....	22
Maryland .....	81	Wisconsin .....	27
Massachusetts.....	48	Wyoming .....	3
Michigan .....	24	Chili .....	1
Minnesota .....	19	China .....	1
Mississippi.....	9	Costa Rica.....	2
Missouri .....	27	Cuba .....	1
Montana.....	2	Germany .....	1
Nebraska.....	12	Japan.....	3
Nevada.....	1	Peru.....	2
New Hampshire.....	15	Venezuela .....	1
New Jersey .....	19		
New York .....	90	Total .....	1,408

### For Undergraduate Students.

To the undergraduate student Washington offers unrivalled opportunities for study. It possesses the academic atmosphere. The absence of commercial and manufacturing activity, the presence in Washington of the largest body of scientific investigators in the country, the discussion of public questions, the spirit of nationalism, and the broad intellectual life constitute a humanizing influence of the greatest value in the development of the American scholar.

To students of science Washington is attractive, since the Government makes an annual appropriation of several millions of dollars for maintaining scientific work, which in its several departments has its headquarters here. The Washington Academy of Sciences and the eleven affiliated societies had, in 1903, a membership of 2,158. All branches of the physical and natural sciences are cultivated here, and the results of investigations are exhibited.

### For Graduate Students.

There is hardly a branch of human activity that is not to some degree taken cognizance of by the National Government. Consequently, there are to be found, in the archives of the State and other Departments and in the statistical bureaus of these Departments, extensive accumulations of original historical documents and data which are invaluable to graduate students in history, political science, economics, sociology, and the allied topics of research. The great Library of Congress, the Public Library of the District of Columbia, and the many highly specialized libraries attached to the various Departments of the Government are made easily accessible by well-designed catalogues.

Hon. Herbert Putnam, LL. D., the Librarian of Congress, in an address at the Commencement of the Department of Arts and Sciences in 1903, spoke of the library resources of Washington as follows:

"There are thus in the city of Washington *thirty-four* governmental libraries freely available for research. These libraries now contain in the

aggregate over two million books and pamphlets and over a half million other articles literary in character—manuscripts, maps, music, and prints. If we add to them the contents of the District Library and of the libraries of private associations and institutions \* \* \* we shall have a total not merely greater than is to be found in any other city of this size in the world, but one which in proportion to population represents several times as many volumes *per capita* as exist for public use in any other city of the world.

\* \* \* \* \*

"Today the Library of Congress is a collection, including duplicates, of over 1,100,000 books and pamphlets and nearly half a million other articles. It is housed in a building devoted to its sole use—the largest library building in the world, the most commodious, the most efficient in equipment for the work which it has to do; a building which provides for ample classification and display of the material, for reasonable growth, and for a multitude and great variety of service; a building which may accommodate a thousand readers at a time and differentiate them to their best advantage."

The Library of Congress offers every inducement to instructors and graduate students to avail themselves of the rich facilities there afforded in the pursuit of their special investigations. In the collections of the National Museum, the Smithsonian Institution, the Army Medical Museum, the Museum of Naval Hygiene, and the departmental museums are found extensive series of specimens, many of them "types" of great value to the student of anthropology, archaeology, mineralogy, geology, paleontology, biology in all its branches, and other topics for research. In the Patent Office are the records of the many inventions that have contributed so materially during our national existence to modify the conditions under which we live.

In the experimental sciences the most notable advantages are to be found, since it is in Washington that the Weather Bureau, with its appliances for the study of national problems in meteorology, is centered; the Coast and Geodetic Survey, from which the surveys of our territory are carried on and by which the figure of the earth and terrestrial magnetism are experimentally determined; the Hydrographic Bureau, which conducts the surveys of foreign coasts and the study of the oceans; the Bureau of Standards, which standardizes the instruments

used in measuring mass, volume, heat, light, electricity, and all other magnitudes; the Geological Survey, which investigates the structure of the earth, ascertains our mineral resources, and supervises the sources of supply and means for distribution and control of water for irrigation purposes; the Department of Agriculture, which exists primarily for conducting original investigations for the benefit of agriculture in all its branches, and is therefore provided with extensively equipped laboratories for the study of chemistry, botany, vegetable physiology, entomology, bio-chemistry, bacteriology, comparative pathology, parasitology, the physics and chemistry of the soil, forestry, and microscopy; the Naval Observatory and Nautical Almanac Office, where researches in astronomy and navigation are conducted; the Marine Hospital Service, which deals with national problems in hygiene; the Bureaus of Construction and of Steam Engineering of the Navy, having supervision over the designs and construction of our ships; the Bureau of Yards and Docks, having supervision over the engineering operations at our navy yards and naval stations; the Bureau of Equipment, which is charged with the electrical installations for the Navy; the U. S. Signal Corps, which has supervision over the electrical installations for the Army; the Engineer Corps of the Army, which is charged with river and harbor improvements, and the Light-House Board, which controls the system for lighting our navigable waters.

Of chemical laboratories for conducting the tests of materials, and especially for research work, there are now eighteen attached to the different departments at Washington. In the graphic arts there is especial activity, as map-making and chart-work is carried on in almost every bureau, while the Supervising Architect's Office of the Treasury Department is the largest office of its kind in the country. The student of pedagogy will find here abundant material collected by the U. S. Bureau of Education.

Washington offers exceptional opportunities for special or advanced work in Mechanical Engineering. The great departments of the Government charged with designing are all located here. In the Bureaus of Steam Engineering and of Construc-

tion and Repair, and Ordnance, of the Navy, there is projected and detailed more heavy constructional work than probably in any other part of the country. Here is also located the U. S. Navy or Ordnance Gun Factory, which is freely open to visits of inspection. The Ordnance Proving Station is located but a few miles down the Potomac. Tours of inspection are also made to the large steel works and shipbuilding plants in Baltimore, while other trips can be made to the shipbuilding plant at Newport News. Washington is also the headquarters for military engineering, as the War Department has charge of all river and harbor improvements for the country, and here is located the headquarters of the Engineer School of Application for the Army. Observations of Patent Office methods will be found advantageous to any engineer. For students intending to pursue special research work or investigations, the opportunities for extending knowledge into the literature of a given subject are unequalled.

In view of the fact that in collecting archives and materials it was the original purpose of the Government "to promote research and the diffusion of knowledge," the Congress of the United States has made these treasures accessible to students under the terms of the following joint resolution, approved April 12, 1892:

*"Resolved by the Senate and House of Representatives of the United States of America in Congress Assembled, That the facilities for research and illustration in the following and any other governmental collections now existing or hereafter to be established in the city of Washington for the promotion of knowledge shall be accessible, under such rules and restrictions as the officers in charge of each collection may prescribe, subject to such authority as is now or may hereafter be permitted by law, to the scientific investigators and to students of any institution of higher education now incorporated or hereafter to be incorporated under the laws of Congress or of the District of Columbia, to wit:*

1. Of the Library of Congress.
2. Of the National Museum.
3. Of the Patent Office.
4. Of the Bureau of Education.
5. Of the Bureau of Ethnology.

6. Of the Army Medical Museum.
7. Of the Department of Agriculture.
8. Of the Fish Commission.
9. Of the Botanic Gardens.
10. Of the Coast and Geodetic Survey.
11. Of the Geological Survey.
12. Of the Naval Observatory."

**For Students of Medicine and Dentistry.**

To students of Medicine and of Dentistry there are excellent facilities for study and research. The Army Medical Museum, which is open for inspection daily, presents a field for study superior to any other institution of the kind, either in this country or in Europe. Its library of medical books and periodicals is the best in the world. It has an unrivalled collection of anatomical and pathological specimens, illustrating normal anatomy and the results of disease in every form, and an almost unlimited number of other preparations showing the effect of gunshot wounds and surgical injuries of every kind. It also contains almost numberless crania of every human nationality, by an examination of which the student can find many dentures of theoretical perfection, and observe the effect of civilization and race admixture upon the dental organs. In Washington is published the well-known *Index Medicus*. At the United States Patent Office are models of every conceivable form of dental instruments. In the National Museum is found the most complete and best arranged collection of Materia Medica in the world. The drugs are shown in all their processes of manufacture, from the original package to the delicate alkaloid constituting the active principle.

An extensive new laboratory is being equipped for the Marine Hospital and Public Health Service. This is the national health department of the Government. In this laboratory and in the laboratories of the Department of Agriculture there are superior facilities for all kinds of bacteriological and chemical investigations, and for the study of bio-chemistry, comparative pathology, and parasitology. The new laboratories and hospitals of the Army and the Navy also offer many opportunities for instruction.

**For Students of Law, Jurisprudence and Diplomacy.**

To students of Law, Jurisprudence and Diplomacy the peculiar advantages of Washington are manifest. The Supreme Court is in session from October to May, and on each Monday morning delivers opinions orally. Students may listen to these and thus keep in touch with the latest utterances of the greatest court. The State Department, with its large library, affords facilities for the study of diplomacy. Congress is in session during the winter, and here the student sees the practical workings of the largest and most important legislative body, and listens to the discussion of matters touching interstate and foreign commerce and diplomatic relations. In Washington one comes into contact with the practical workings of the National Government in all its parts, and may secure the views and advice of practical men in all the great departments. Many of the lecturers in the Departments of Law and Jurisprudence and Diplomacy occupy the most important official positions in the gift of the nation and speak from a practical knowledge of the subjects they teach.

# Department of Arts and Sciences.

## UNDERGRADUATE AND GRADUATE.

### FACULTY.

- CHARLES W. NEDHAM, LL. D.,  
President of the University.
- JAMES HOWARD GORE, Ph. D.,  
Head Professor of Mathematics.
- HOWARD LINCOLN HODGKINS, Ph. D.,  
Head Professor of Physics.
- JAMES MACBRIDE STERRETT, A. M., D. D.,  
Head Professor of Philosophy.
- CHARLES E. MUNROE, Ph. D.,  
Head Professor of Chemistry.
- HERMANN SCHOENFELD, Ph. D., LL. D.,  
Head Professor of German.
- CHARLES CLINTON SWISHER, Ph. D.,  
Head Professor of History.
- WILLIAM ALLEN WILBUR, A. M.,  
Head Professor of English.
- MITCHELL CARROLL, Ph. D.,  
Head Professor of Classical Philology.
- GEORGE N. HENNING, A. M.,  
Head Professor of Romance Languages.
- THEODORE N. GILL, Ph. D., LL. D.,  
Professor of Zoölogy.
- CLEVELAND ABBE, A. M., LL. D.,  
Professor of Meteorology.
- EDGAR FRISBY, A. M.,  
Professor of Astronomy.
- FRANK W. CLARKE, Sc. D.,  
Professor of Mineral Chemistry.
- HARVEY W. WILEY, Ph. D.,  
Professor of Agricultural Chemistry.
- FRANK HAGAR BIGELOW, A. M., L. H. D.,  
Professor of Astro-Physics.
- GEORGE P. MERRILL, Ph. D.,  
Professor of Geology and Mineralogy.

- FRANK A. WOLFF, Ph. D.,  
Professor of Electrical Engineering.
- HERBERT LOUIS RICE, M. S.,  
Professor of Astronomy.
- HENRY A. PRESSEY, B. S.,  
Professor of Civil Engineering.
- ERNEST L. THURSTON, C. E.,  
Professor of Graphics.
- PAUL BARTSCH, M. S.,  
Professor of Zoölogy.
- PERCY ASH, C. E.,  
Professor of Architecture.
- WILLIAM P. CUTTER, B. S.,  
Professor of Library Science.
- FRANK VAN VLECK, M. E.,  
Acting Professor of Mechanical Engineering.
- ROLAND P. FALKNER, Ph. D.,  
Professor of Economics.
- O. F. COOK, Ph. B.,  
Professor of Botany.
- EDWARD ADAMS MUIR, B. S.,  
Assistant Professor of Graphics.
- CHARLES S. SMITH, A. M.,  
Assistant Professor of Greek and Latin.
- FRANK G. RADELFINGER, B. S.,  
Assistant Professor of Mathematics.
- N. MONROE HOPKINS, Ph. D.,  
Assistant Professor of Chemistry.
- 
- TIMOTHY W. STANTON, A. M., Ph. D.,  
Instructor in Paleontology and Stratigraphical Geology.
- \* FAIRFAX BAYARD, C. E.,  
Instructor in Applied Mathematics.
- MAYVILLE W. TWITCHELL, M. S.,  
Instructor in Mineralogy.
- BERNARD HERMAN, B. S.,  
Instructor in Civil Engineering.
- † R. E. NELSON, JR.,  
Instructor in Civil Engineering.

\* Resigned January 1, 1904.

† Resigned February 1, 1904.

*Department of Arts and Sciences.*

11

- ✓ PHILANDER BETTS, E. E.,  
Instructor in Electrical Engineering and Mechanical Engineering.
- ✓ EDWIN A. HILL, Ph. D.,  
Instructor in Chemistry.
- ✓ CARL HAU, A. M.,  
Instructor in German.
- ✓ LOUIS E. GILES, B. S.,  
Instructor in Mechanical Engineering and in Graphics.
- ✓ LOUIS A. SIMON,  
Instructor in Architecture.
- THOMAS MALCOLM PRICE, Ph. D.,  
Instructor in Chemistry.
- WM. M. COLEMAN, A. M.,  
Instructor in Philosophy.
- \* OSCAR QUICK, A. M.,  
Instructor in Physics.
- JOHN CLEVELAND WELSH, M. S.,  
Instructor in Botany.
- F. L. MOLBY,  
Instructor in Freehand Drawing.
- A. B. MARVIN, JR., B. S.,  
Instructor in Electrical Engineering and Physics.
- HENRY J. LUCKE, A. B.,  
Instructor in Applied Mathematics.
- FRANCIS R. WELLER, B. S.,  
Instructor in Civil Engineering.
- ✓ LEVI RUSSELL ALDEN, A. B.,  
Assistant in History.
- CLARENCE HALL,  
Assistant in Assaying.
- ✓ RAYMOND OUTWATER,  
Assistant in Chemistry.
- HARRY LUDWIG COLESTOCK,  
Assistant in English.
- ALICE F. STEVENS,  
Assistant in Library Science.
- WILLIAM WEBB SNIFFIN,  
Assistant in French.
- PAUL NOBLE PECK,  
Assistant in Greek and Latin.

\* Resigned February 1, 1904.

## LECTURERS.

- OTIS T. MASON, Ph. D., LL. D.,  
Lecturer on Anthropology.
- WILLIAM T. HARRIS, Ph. D., LL. D.,  
Lecturer on Philosophy.
- THOMAS M. CHATARD, Ph. D.,  
Lecturer on Chemical Engineering.
- JOSEPH C. HORNBLLOWER, Ph. B.,  
Lecturer on Architectural History.
- AINSWORTH R. SPOFFORD, LL. D.,  
Lecturer on Library Science.
- ALBERT BURNLEY BIBB,  
Lecturer on Architectural History.

## STANDING COMMITTEES OF THE FACULTY.

*Committee on the Bachelor of Arts Course.*  
Professors GORE, SWISHER, CARROLL.

*Committee on the Bachelor of Science Course.*  
Professors HODGKINS, WILBUR, HENNING.

*Committee on Higher Degrees.*  
Professors MUNROE, STERRETT, SCHOENFELD.

*Committee on the Schedule.*  
Professors HENNING, GORE, HODGKINS.

## ADMISSION.

The session of 1904-1905 begins Wednesday, September 28, 1904.

The Department of Arts and Sciences is open to young men and young women.

The main building of the University, in which most of the courses of study in this Department are conducted, is University Hall, corner Fifteenth and H streets, N. W.

Every applicant for admission is required to present a testimonial of good moral character, and also a certificate of standing and regular dismissal from the school or college which he has attended or from the tutor with whom he has studied.

Candidates for admission to the Freshman Class may present certificates of admission or take an examination in the required books and subjects. Certificates, in lieu of any or all

examinations, will be accepted from schools whose work is attested by well-prepared students admitted to the University in previous years, and from schools desiring coöperation with the University, that present evidence of affording adequate preparation in the required books and subjects. The Corresponding Secretary will, on application, furnish certificate blanks to the principals of such accredited schools.

The certificate of the College Entrance Examination Board for the Middle States and Maryland will be accepted in so far as the subjects specified meet the requirements for admission.

The certificate of the Washington High Schools covering all the requirements for admission admits students without examination to the courses of the Freshman year.

The certificates of all schools accredited to the University will be accepted in so far as they specifically meet the requirements for admission.

*The general requirement for admission is a four-year High School course, or its equivalent, consisting usually of four or five recitations per week in four or more topics. The High School studies which may be presented in satisfaction of the requirements of admission are given in the adjoining table, the unit being four or five recitations per week for one school year. The figures show the relative value of each subject. The list is substantially that set forth in Document No. 8 of the College Entrance Examination Board.*

## LIST OF PREPARATORY SUBJECTS FOR EXAMINATION.

	Units.		Units.
English . . . . .	4	History :	
Latin :		Ancient . . . . .	1
Elementary . . . . .	2	Mediaeval and Mod-	
Intermediate . . . . .	1	ern . . . . .	1
Advanced . . . . .	1	English . . . . .	1
Greek :		American . . . . .	1
Elementary . . . . .	2	Mathematics :	
Advanced . . . . .	1	Elementary Algebra	1
French :		Advanced Algebra	$\frac{1}{2}$
Elementary . . . . .	2	Plane Geometry . . .	1
Intermediate . . . . .	1	Solid Geometry . . .	$\frac{1}{2}$
Advanced . . . . .	1	Plane Trigonometry	$\frac{1}{2}$
Spanish . . . . .	2	Physics . . . . .	1
German :		Chemistry . . . . .	1
Elementary . . . . .	2	Botany . . . . .	1
Intermediate . . . . .	1	Zoölogy . . . . .	1
Advanced . . . . .	1	Physiography . . . . .	1
		Drawing . . . . .	1

## TERMS OF ADMISSION TO BACHELOR OF ARTS COURSES.

Candidates for admission to the courses leading to the degree of Bachelor of Arts are required to present subjects from the list of High School studies aggregating fifteen units, distributed as follows :

	Units.
English . . . . .	4
Latin . . . . .	4
Greek <i>or</i> . . . . .	3
French and German <i>or</i> . . . . .	
French <i>or</i> German . . . . .	1
Elementary Algebra . . . . .	1
Plane Geometry . . . . .	2
Electives . . . . .	15

## TERMS OF ADMISSION TO BACHELOR OF SCIENCE COURSES.

Candidates for admission to the courses leading to the degree of Bachelor of Science are required to present subjects from the list of High School studies aggregating fifteen units, distributed as follows :

	Units.
English . . . . .	4
French <i>or</i> German . . . . .	2
Elementary Algebra . . . . .	1
Plane Geometry . . . . .	1
Physics . . . . .	1
Chemistry . . . . .	1
Electives . . . . .	5
	15

## EXAMINATIONS FOR ADMISSION.

The regular examination for admission to the Freshman Class is held in University Hall, southeast corner of Fifteenth and H streets, N. W., in May. A second examination is held at the beginning of the academic year, in September. The following is the schedule for both examinations :

*Department of Arts and Sciences.*

15

*May 27 and September 23, 1904.*

Registration of Applicants . . . . .	8.30- 9.00
Latin; Advanced French or German . . . . .	9.00-11.00
Plane Geometry . . . . .	11.00- 1.00
Elementary Algebra . . . . .	2.00- 4.00

*May 28 and September 24.*

Greek; Physics . . . . .	9.00-11.00
History . . . . .	11.00- 1.00
German . . . . .	2.00- 4.00

*May 30 and September 26.*

Plane Trigonometry; Botany . . . . .	9.00-11.00
French . . . . .	11.00- 1.00
English . . . . .	2.00- 4.00

*May 31 and September 27.*

Advanced Algebra; Zoölogy; Drawing . . . . .	9.00-11.00
Solid Geometry; Spanish . . . . .	11.00- 1.00
Chemistry; Physiography . . . . .	2.00- 4.00

Subjects offered for admission, but not named in the schedule of examinations, will be arranged for as occasion arises.

The University is prepared to appoint examinations in any city, or at any school where the number of applicants or the distance from Washington may warrant it. Correspondence on this subject should be addressed to the Corresponding Secretary of the University.

Unless admitted by certificate, every undergraduate candidate for a degree is required to pass an examination.

DEFINITION OF REQUIREMENTS.

ENGLISH.

(Counting four units.)

Candidates are expected to be familiar with the elements of rhetoric, and no candidate will be accepted whose work is obviously defective in spelling, punctuation, idiom, or division into paragraphs.

The examination in English consists of two parts, one to test general reading, the other to show the results of more careful study and practice.

1. *Reading and Practice.* The candidate will be required to write a paragraph or two on each of several topics chosen by him from a considerable number—perhaps ten or fifteen—set before him in the examination paper. The candidate should read all the prescribed books, but knowledge of them will be regarded as less important than ability to write good English. The books set for this part of the examination are:

Addison and Steele's <i>Sir Roger de Coverley Papers</i> . . . . .	1904	'05	'06	'07	'08
Carlyle's <i>Essay on Burns</i> . . . . .	1904	'05	....	....	....
Coleridge's <i>Ancient Mariner</i> . . . . .	1904	'05	'06	'07	'08
George Eliot's <i>Silas Marner</i> . . . . .	1904	'05	'06	'07	'08
Goldsmith's <i>Vicar of Wakefield</i> . . . . .	1904	'05	....	....	....
Irving's <i>Life of Goldsmith</i> . . . . .	....	....	'06	'07	'08
Lowell's <i>Vision of Sir Launfal</i> . . . . .	1904	'05	'06	'07	'08
Scott's <i>Ivanhoe</i> . . . . .	1904	'05	'06	'07	'08
Scott's <i>Lady of the Lake</i> . . . . .	....	....	'06	'07	'08
Shakespeare's <i>Julius Cæsar</i> . . . . .	1904	'05	....	....	....
Shakespeare's <i>Macbeth</i> . . . . .	....	....	'06	'07	'08
Shakespeare's <i>Merchant of Venice</i> . . . . .	1904	'05	'06	'07	'08
Tennyson's <i>The Princess</i> . . . . .	1904	'05	....	....	....
Tennyson's <i>Gareth and Lynette, Lancelot and Elaine, and the Passing of Arthur</i> . . . . .	....	....	'06	'07	'08

2. *Study and Practice.* This part of the examination presupposes the thorough study of each of the works named. It involves knowledge of the subject-matter, literary form, literary history, grammatical and logical structure.

The books set for this part of the examination are:

Burke's <i>Speech on Conciliation with America</i> . . . . .	1904	'05	'06	'07	'08
Macaulay's <i>Essay on Addison</i> . . . . .	1904	'05	....	....	....
Macaulay's <i>Essay on Milton</i> . . . . .	1904	'05	'06	'07	'08
Macaulay's <i>Life of Johnson</i> . . . . .	....	....	'06	'07	'08
Milton's <i>L'Allegro, Il Penseroso, Comus, and Lycidas</i> . . . . .	1904	'05	'06	'07	'08
Shakespeare's <i>Julius Cæsar</i> . . . . .	....	....	'06	'07	'08
Shakespeare's <i>Macbeth</i> . . . . .	1904	'05	....	....	....

#### LATIN.

The minimum requirements in Latin and Greek are in substantial agreement with those set forth in Document 8 of the

College Entrance Examination Board, which carry out the recommendations of the Committee of Twelve of the American Philological Association:

*The Elementary Requirement* (counting two units) :

- a. i. Latin Grammar : The inflections ; the simpler rules for composition and derivation of words ; syntax of cases and the verbs ; structure of sentences in general, with particular regard to relative and conditional sentences, indirect discourse, and the subjunctive ; so much prosody as relates to accent, versification in general, and dactylic hexameter.
- ii. Latin Prose Composition : Translation into Latin of detached sentences and easy continuous prose based upon Cæsar.
- b. Cæsar : Any four books of the Gallic War, preferably the first four, or their equivalent.

*The Advanced Requirement\** (counting two units).

- a. Cicero : Any six orations from the following list, but preferably the first six mentioned :  
The four orations against Catiline, Archias, the Manilian Law, Marcellus, Roscius, Milo, Sestius, Ligarius, the Fourteenth Philippic.
- b. Vergil : The first six books of the *Æneid*.
- c. Advanced Prose Composition, consisting of continuous prose of moderate difficulty based on Cicero.
- d. Sight Translation, based on prose of no greater difficulty than the easier portions of Cicero's orations.

GREEK.

*The Elementary Requirement* (counting two units).

- a. i. Greek Grammar : The topics for the examination in Greek grammar are similar to those detailed under Latin grammar.
- ii. Greek Prose Composition, consisting principally of detached sentences to test the candidate's knowledge of grammatical constructions.

\* This may be divided into *a*, Intermediate ; *b*, Advanced, requirements at the convenience of candidates, each counting one unit.

The examination in grammar and prose composition will be based on the first two books of Xenophon's *Anabasis*.

*b.* Xenophon: The first four books of the *Anabasis*.

*The Advanced Requirement* (counting one unit).

*a.* Homer: The first three books of the *Iliad* (omitting II, 494, to end).

*b.* Sight Translation, based on prose of no greater difficulty than Xenophon's *Anabasis*.

#### FRENCH.

*Elementary* (counting two units). Candidates in Elementary French must have a good knowledge of the essential parts of grammar, with stress on pronouns and on regular verbs and the common irregular verbs. They must know the principles of pronunciation; must be able to translate simple English sentences or easy connected prose into French, and to translate accurately ordinary modern French prose. Candidates must have translated not less than 450 duodecimo pages by at least four different authors, of which amount at least one-third must be history. Candidates must have had a two-years' course of at least four periods per week.

*Intermediate* (counting one unit). Candidates in Intermediate French must have, in addition, a good knowledge of the remaining grammatical forms and of syntactical difficulties. They must be able to translate ordinary connected English prose into French, and to translate accurately and idiomatically difficult modern French. Candidates must have partly translated, partly read, in addition to the requirements for Elementary French, at least 500 pages of several different authors, including history, fiction, drama, and some poetry. Candidates must have had a three-years' course of at least four periods per week.

*Advanced* (counting one unit). Candidates in Advanced French must have partly translated, partly read, in addition to the requirements for Intermediate French, at least 600 pages of difficult French of several different authors, including history, fiction, drama, and poetry. Candidates must have had a four-years' course of at least four periods per week.

Fraser and Squair's French Grammar or Grandgent's Essentials of French Grammar is recommended.

## SPANISH.

(Counting two units.)

Candidates in Spanish must have a good knowledge of grammar, including syntax, with stress on pronouns and verbs, regular and irregular. They must know the principles of pronunciation. They must be able to translate simple English sentences or easy connected prose into Spanish, and to translate accurately fairly difficult modern Spanish prose and verse. Candidates must have translated not less than 500 pages by at least four different authors, of which amount at least one-fourth must be history or drama. Candidates must have had a two-years' course of at least four periods per week.

## GERMAN.

*Elementary* (counting two units). Candidates in Elementary German must have had a two-years' course of at least four periods a week. They must be able to read fluently at sight and to translate easy narrative prose and poetry. An accurate knowledge of an elementary German grammar is requisite, to be tested by the translation into German of some fifteen sentences. About 300 pages of graduated narrative prose, one short play, and such poetry as is usually found in a First Reader will be considered an adequate preparation.

*Intermediate* (counting one unit). Candidates in Intermediate German must have had a three-years' course or its equivalent of four periods a week. Translation at sight from modern German prose. Requirements: Three prose books, preferably such as are given in the Report of the Committee of Twelve of the Modern Language Association; one classical drama, preferably *Wilhelm Tell*; and *Das Lied von der Glocke*; 500 pages of lyric and ballads. German composition and an easy essay in German.

*Advanced* (counting one unit). Candidates in Advanced German must have had a four-years' course of at least four periods a week. They should be well trained in the syntactical laws of the language, have read about 500 pages of good literature in prose and poetry, especially dramas by Lessing, Schiller, and Goethe, and studied an elementary history of German literature. German composition should comprise a number of short themes upon assigned historical or literary topics, lives of the authors read, etc.

## HISTORY.

In this subject special importance is attached to preparation in geography.

*Ancient* (counting one unit):

- (a) Greek History, through the Roman Conquest; as much as is contained in Myers' History of Greece.
- (b) Roman History; as much as is contained in Allen's History of the Roman People.

*Mediæval and Modern European History* (counting one unit).  
As much as is contained in Myers' History of Mediæval and Modern Europe.

*English History* (counting one unit). As much as is contained in Larned's History of England.

*American History* (counting one unit). As much as is contained in Fiske's History of the United States.

## MATHEMATICS.

*Elementary Algebra* (counting one unit).

## i. Algebra to Quadratics:

The four fundamental operations for rational algebraic expressions, factoring, highest common factor, lowest common multiple, complex fractions, the solution of equations of the first degree containing one or more unknown quantities, radicals, including the extraction of the square root of polynomials and numbers, and fractional and negative exponents.

## ii. Quadratics, etc.:

Quadratic equations and equations containing one or more unknown quantities that can be solved by the methods of quadratic equations, problems depending upon such equations, ratio and proportion, and the binomial theorem for positive integral exponents. !

*Advanced Algebra* (counting one unit).

## i. Progressions, etc.:

The progressions, the elementary treatment of permutations and combinations, and the use of four and five place tables and logarithms.

ii. Series, etc. :

Undetermined coefficients, the elementary treatment of infinite series, the binomial theorem for fractional and negative exponents, and the theory of logarithms.

iii. Theory of equations :

Determinants and the elements of the theory of equations, including Horner's method for solving numerical equations.

*Plane Geometry* (counting one unit).

The solution of simple original exercises and numerical problems.

*Solid Geometry* (counting one-half unit) :

Properties of straight lines and planes, of dihedral and polyhedral angles, of projections, of polyhedrons, including prisms, pyramids, and the regular solids ; of cylinders, cones, and spheres ; of spherical triangles, and the measurement of surfaces and solids.

*Plane Trigonometry* (counting one-half unit) :

The definitions and relations of the six trigonometrical functions as ratios, proof of important formulæ, theory of logarithms and use of tables, solution of right and oblique plane triangles.

PHYSICS.

(Counting one unit.)

It is recommended that the candidate's preparation should include :

- a. Individual laboratory work, comprising at least thirty-five exercises well distributed over the subjects of physics.
- b. Instruction by lecture-table demonstrations.
- c. The study of at least one standard text-book, supplemented by the use of many and varied numerical problems. The metric system should be familiar to the student.

The laboratory note book must be submitted for inspection, whether the candidate is admitted on certificate or by examination.

## CHEMISTRY.

(Counting one unit.)

The candidate's preparation in chemistry should include :

*a.* Individual laboratory work, comprising at least forty experiments of a character analogous to those set forth in Document No. 8 of the College Entrance Examination Board.

On application for admission to this University, every candidate seeking credit in chemistry must present a note book in which he has recorded the steps and the results of his laboratory exercises. This note book must contain an index to its contents, and must bear an endorsement of the teacher who directed the student, written in ink on the inside of the cover, in the following form :

I certify that this note book is the true and original record of experiments actually performed by \_\_\_\_\_ in the chemical laboratory of \_\_\_\_\_ school during the year 19—.

(Signed)

Title \_\_\_\_\_ [*Instructor*] in Chemistry.

*b.* Instruction by lecture-table demonstrations to be used in instructing the student as to methods of manipulation and as a basis for questioning him upon the general principles involved in his laboratory experiments.

*c.* The study of at least one modern text-book, to the end that the student may gain a comprehensive and connected view of the most important facts and laws of elementary chemistry.

*Requirements.* The ground to be covered should include the following: The chief physical and chemical characteristics, the isolation and the recognition of the following elements and the preparation and study of their principal compounds: *Oxygen, hydrogen, carbon, nitrogen, chlorine, bromine, iodine, fluorine, sulphur, phosphorus, silicon, potassium, sodium, calcium, magnesium, zinc, copper, mercury, silver, aluminum, lead, tin, iron, manganese, chromium.*

The more detailed study should be confined to the italicized *elements* (as such) and to a restricted list of compounds, such as water, hydrochloric acid, carbon monoxide, carbon dioxide, oxides of nitrogen, nitric acid, ammonia, sulphur dioxide, sulphuric acid, hydrogen sulphide, sodium hydroxide, ammonium hydroxide.

Attention should be given to the atmosphere (constitution and relation to animal and vegetable life), flames, acids, bases,

salts, oxidation and reduction, crystallization, combining proportions by weight and volume, calculations founded on these and on Boyle's and Charles's laws, symbols, formulas, equations and nomenclature, atomic theory, atomic weights, valency (in a very elementary way), nascent state, natural groupings of the elements, solution (solvents and solubility of gases, liquids, and solids), ionization, mass action and equilibrium, strength of acids and bases, conservation and dissipation of energy, chemical energy, electrolysis. Chemical terms should be clearly understood, and the student should be able to illustrate and apply the ideas that they embody. The theoretical topics are not intended to form separate subjects of study, but to be taught only so far as is necessary for the correlation and explanation of the experimental facts. The facts should be given as examples from various classes and not as isolated things.

#### BOTANY.

(Counting one unit.)

Candidates must have had at least one year's full work in Botany, comprising the General Principles of Morphology, Physiology, and Ecology, as well as in the Natural History of Plant Groups and Classification. Bergen's *Foundations of Botany* and Atkinson's *Elementary Botany* indicate the general scope of the work required.

#### ZOÖLOGY.

(Counting one unit.)

In general, zoölogy is not recommended as an entrance subject unless the study has been preceded or accompanied by that of physics and chemistry, which form the most desirable groundwork for collegiate courses in biology. The entrance examination in zoölogy is designed to test, first, the candidate's practical acquaintance with the natural history, structure, and relationships of some of the leading types of animals, and, second, his knowledge of the more essential facts of physiology.

*Practical Zoölogy.* A practical examination of at least ten common animal types, and the presentation by the candidate of a laboratory note book, certified by the teacher, as evidence of a laboratory course actually performed. Examples of the types suggested are the frog, fish, mollusk, insects, crustaceans, annelid, starfish, hydroid (hydra), and protozoan. In the examination less weight is laid on a knowledge of anatom-

ical minutiae than on the ability to recognize the specimen and its allies, to indicate its relationship, and to point out the leading features of its life history, organization, and physiology.

*Elementary Physiology.* The nature of foods and their history in the body; the essential facts of digestion, absorption, circulation, secretion, excretion, and respiration; the motor, nervous, and sensory functions, and the structure of the various organs by which these operations are performed. Martin's *Human Body* (briefer course) forms a suitable basis for this work, but teachers are recommended as far as possible to correlate the physiology of man and the higher animals with that of the lower forms studied in the course of practical zoölogy.

#### PHYSIOGRAPHY.

(Counting one unit.)

The equivalent of Davis's *Physical Geography*, together with an approved laboratory and field course of at least forty exercises actually performed by the candidate.

The candidate will be required to present at the time of his examination the original note book in which he recorded, with dates, the steps and results of his laboratory exercises. This book, which should contain an index of subjects, must bear the endorsement of the teacher, certifying that it is a true record of the candidate's work.

#### DRAWING

(Counting one unit.)

The candidate's preparation in drawing should include simple geometrical, plane, and solid figures and simple pieces of machinery, with a fair knowledge of the rules of perspective and light and shade as applied in free-hand sketching. The candidate should be able to reproduce from a flat copy with enlargement or reduction of size.

For courses in architecture, the preparation should include, in addition to the above, the drawing of simple pieces of architectural ornament (a Greek anthemium, a design of iron scroll-work, etc.).

For courses in engineering, the preparation should include the copying of machinery details.

For courses in general science or in science for teachers, the preparation should include the copying of still life and simple plant forms.

#### ADMISSION TO ADVANCED STANDING.

Candidates for admission to advanced classes in any department are examined in all indispensable preliminary studies.

Due credit is given for properly certified courses of study pursued elsewhere.

#### ADMISSION TO SPECIAL COURSES.

All the courses of instruction are open to students of suitable age and attainments who wish, without reference to any degree, to pursue special studies. Candidates are examined in each special study. They must be familiar with the subjects preliminary to the studies which they wish to pursue.

#### AUDITORS.

Certain courses are open to the public on payment of an auditor's fee. Auditors are without responsibility for class exercises or examinations, and they will receive no credit on the records.

#### ADMISSION TO COURSES FOR HIGHER DEGREES.

The higher degrees conferred in course by the University in the Department of Arts and Sciences are Master of Arts (A. M.), Master of Science (M. S.), Civil Engineer (C. E.), Electrical Engineer (E. E.), Mechanical Engineer (M. E.), and Doctor of Philosophy (Ph. D.).

#### DEFINITION OF REQUIREMENTS.

Before a student can be admitted to candidature for a higher degree he must give evidence that he has completed a liberal undergraduate course of academic study such as is required by colleges of good standing antecedent to the baccalaureate degree. The President's Council reserves the right to decide in all cases whether the antecedent training fulfills the requirements.

Graduates of other institutions desiring to enter Columbian University for a higher degree must in every case present their diplomas or certificates that they have received such diplomas, together with catalogues of the institutions from which they hold their degrees and certificates of their courses of study at such institutions. All such applications should be accompanied by testimonials as to character and scholarship.

## PROCEDURE FOR ADMISSION.

Candidates for admission to courses for higher degrees must present the diplomas they hold, or certificates that they have received such diplomas, to the Corresponding Secretary of the University, and obtain application blanks, which are supplied by the Registrar. When properly filled and signed, these applications are to be submitted to the Chairman of the Committee on Higher Degrees, together with a catalogue of the institution from which the candidate received his diplomas. The applicant will thereupon be informed in writing of the action taken upon his application. When the applicant is informed that his application is approved, he should present himself at once to the Registrar and matriculate. He should then present his matriculation paper to the Chairman of the Committee on Higher Degrees for his signature, and also obtain the signatures upon his matriculation paper of each of the professors with whom he is to study during the year. When this paper has been thus executed the student must sign it and return it to the Registrar.

## UNIVERSITY SUBJECTS.

University subjects are divided into three sections, in accordance with the following requirement of an ordinance adopted by the Board of Trustees October 13, 1902 :

ARTICLE IV. SECTION 1. Subjects shall be divided into three sections, as follows :

(1.) The fundamental section, covering two years' work; this section to be assigned to students in the general culture courses.

(2.) The advanced section, not exceeding three years; this section to be assigned to students specializing for literary, scientific, professional, or industrial pursuits.

(3.) The original research section; this section to be assigned to students pursuing a subject for discovery and broader culture. }

The courses in the first section are sometimes recommended to graduate students, but are not ordinarily counted toward the master's degree.

The courses in the second section may be taken by students in the second year of their course only by special permission of the professor in charge.

The courses in the third section are open to undergraduates only on the recommendation of the instructors, and no undergraduate student shall take in one year more than one course in the third section.

When an announced course has not been applied for by at least three students, candidates for a degree, the instructor shall be at liberty to withdraw the course.

First-section courses are numbered from 1 to 19, inclusive; second-section courses from 20 to 39, inclusive; third-section courses are numbered on from 40. The number of hours, unless otherwise specified, indicates hours per week throughout the year. The unit of credit is one hour of recitation or lecture work per week for one academic year; laboratory hours count one-half unit each. Sixty hours of credit is the minimum requirement for the bachelor's degree.

Libraries, laboratories, and drawing-rooms will be open from 9.30 a. m. till 10 p. m., with competent assistants in charge to direct students.

No student is admitted to a course unless he fulfills all of the requirements for that course, or otherwise satisfies the instructor that he is prepared to pursue it.

Every student must make his election of courses so as to avoid conflict between the hours appointed for recitations.

#### APPLIED MATHEMATICS.

\* FAIRFAX BAYARD, C. E., Instructor in Applied Mathematics.  
HENRY J. LUCKE, A. B., Instructor in Applied Mathematics.

*Second Section. For Undergraduates and Graduates.*

20. Analytical and Applied Mechanics. Tuesday, Thursday, and Saturday, at 4.50.

21. Hydraulics. Friday, at 5.40.

22. Strength of Materials and Theory of Elasticity. Wednesday and Saturday, at 5.40.

#### ARCHÆOLOGY, CLASSICAL.

MITCHELL CARROLL, A. M., Ph. D., Head Professor of Classical Philology.

*Second Section. For Undergraduates and Graduates.*

For a proper appreciation of the languages, literatures, and history of Greece and Rome, some knowledge of ancient life

\* Resigned January 1, 1904.

and art is essential. To meet this need, the following cycle of courses in Classical Archæology, extending over a period of three years is offered. Each course consists of weekly lectures, illustrated by maps, plans, photographs, and lantern slides, supplemented by a prescribed course of reading and the preparation of papers on special topics. The work constitutes a two-hour elective for advanced undergraduate and graduate students, but it is open to all students. A knowledge of Greek or Latin is not essential.

20. Topography and Monuments of Athens and Rome. A study of the history, topography, and monuments of the chief centres of ancient life. Not given in 1904-05. Given in 1906-07. Tuesday and Thursday at 4.50.

21. Private Life of the Greeks and Romans. A study of the ancient house, its architecture, furniture, and ornamentation; family life; education and amusements; dress, arms, and armor; religious festivals, rites, and ceremonies, and other aspects of Greek and Roman life. Not given in 1904-05. Given in 1905-06. Two hours.

22. Greek and Roman Architecture and Sculpture. Given in 1904-05. Tuesday and Thursday, at 4.50.

In all these courses considerable use will be made of the illustrative material accessible in the Library of Congress, the Corcoran Gallery of Art, the Smithsonian Institution, and the Halls of the Ancients.

## ARCHITECTURE.

PERCY ASH, B. S., C. E., Professor of Architecture.

JOSEPH C. HORNBLOWER, Lecturer on Architectural History.

ALBERT BURNLEY BIBB, Lecturer on Architectural History.

LOUIS A. SIMON, Instructor in Architecture.

F. L. MOLBY, Instructor in Freehand Drawing.

*First Section. Primarily for Undergraduates.*

1. Freehand Drawing. Wednesday, at 5.40.
2. Architectural Drawing (the five orders).
3. Advanced Freehand Drawing. Two periods, senior year.
4. Architectural Drawing. A review of the orders, with details to a large scale; measured drawings of existing build-

ings; copies and enlargements of plans and working drawings. Two periods, Freshman year. First term.

5. Architectural Design. Elementary composition; six problems or the equivalent. Two periods, Freshman year.

6. Building Construction. One hour.

7. Perspective. One hour, Senior year.

*Second Section. For Undergraduates and Graduates.*

20. Pen-and-ink Rendering. One hour, Junior year.

21. Water-color Sketching. One hour, Senior year.

22. Projections, Shades, and Shadows. One hour, Junior year.

23. History of Architecture. Egyptian, Assyrian, Grecian, and Roman. One hour, Junior year.

24. History of Architecture. Romanesque, Gothic, and Renaissance. One hour, Senior year.

25. Architectural Design. Six problems or the equivalent. Two hours, Junior year.

26. Architectural Design. Six problems or the equivalent. Five hours, first term, Senior year.

27. Thesis. An original design; a discussion of an architectural problem. Second term, Senior year.

28. Building Materials and Construction. Two hours, Junior year.

29. Specifications. One hour, second term, Senior year.

30. Inspection of buildings erected or in course of erection. Junior and Senior years.

The hours for these courses will be announced at the opening of the session, and will be between 4.50 and 6.30. The assigned problems in design will require from the student not less than twelve hours a week.

A special course is arranged to suit the requirements of architectural or student draftsmen who may desire to supplement the practical experience of office work with special training in design, rendering, and other technical subjects. It is also open to others whose previous education is such that they can, in the opinion of the professor in charge, pursue the course to advantage. No entrance examinations will be required, but

a certain degree of proficiency in drawing and the rudiments of architecture is expected. Special students may enter at any time and pursue any class of work for which they are fitted.

The courses for special students are usually the following:

Design. Two hours.

Projections, Shades, and Shadows. One hour.

Water-color or Pen-and-ink Rendering with Perspective. One hour.

Construction. One hour.

History of Architecture. One hour.

Additional time in the drafting-room is necessary in order to complete the assigned problems in design.

## ASTRONOMY.

EDGAR FRISBY, A. M., Professor of Astronomy.

HERBERT LOUIS RICE, M. S., Professor of Astronomy.

### *First Section. Primarily for Undergraduates.*

1. General Descriptive Astronomy. Young's General Astronomy, with occasional lectures illustrated with the stereopticon. The student is taught the use of star charts in locating the constellations. When circumstances permit, students will observe telescopic objects of interest, and also make some of the fundamental observations of practical astronomy, which will be used in the solution of problems. Monday and Thursday, at 5.40. Professor FRISBY.

### *Second Section. For Undergraduates and Graduates.*

20. Mathematical and Theoretical Astronomy. Theory taught mainly by lectures, supplemented by the solution of problems and practical computations. The course includes the discussion and application of various formulæ for interpolation and tabular differentiation and the practical precepts for correcting errors by means of differences; considerations respecting the elliptic form of the earth's meridian, and the derivation of formulæ for computing the "latitude reduction" and  $\log p$ ; transformations of the various coördinate systems employed in spherical astronomy; the construction and use of the American Ephemeris, or Nautical Almanac, including computations of the principal quantities contained in that fundamental work; a discussion of the laws of planetary (elliptic) motion, and the application of Lagrange's Theorem to the solution of Kepler's

problem and similar questions ; the definition of the elements of an orbit, and their use in fixing the position of a planet in space ; the reduction of heliocentric coördinates to geocentric, including the corrections for nutation and aberration, etc., etc. This course is at once thorough and comprehensive, and is designed to meet fully the requirements of both the theoretical student and the practical computer. A thorough training in mathematics is presupposed. Four hours. Professor RICE.

*Third Section. Primarily for Graduates.*

40. The Theory of Computing the Parabolic Orbit of a Comet from Three Observations, with an ephemeris. Encke's Memoir on Olbers' Method, *Abhandlungen, Erster Band*. Books of reference : Watson's *Astronomy*, Oppolzer's *Bahnbestimmung der Cometen und Planeten*. Professor FRISBY.

41. The Theory of Computing an Elliptical Orbit, or any Conic Section, from Three or Four Observations. Gauss' *Theoria Motûs*. Books of reference, as above. Professor FRISBY.

42. An outline of the Method of Least Squares. Encke, Chauvenet, Brünnow, Watson, Johnson. Professor FRISBY.

44. The Theory of General Perturbations. Tisserand, *Mécanique Céleste*. Books of reference : Laplace, *Mécanique Céleste* ; Lagrange, *Mécanique Analytique*, and *Memoirs* ; Leverrier, *Annals of the Paris Observatory* ; Hansen, *Auseinandersetzung* ; Pontécoulant, *Système du Monde*, etc. Professor FRISBY.

45. General Spherical Astronomy. Chauvenet's or Brünnow's *Spherical Astronomy*. Professor FRISBY.

50. On the construction and use of the American Ephemeris and Nautical Almanac. Embracing a complete discussion, both theoretical and practical, of all the important elements and data contained in this fundamental work. A practical course for computers. Professor RICE.

51. Spherical and Mathematical Astronomy. A more general course than the preceding, covering the most important of the subjects discussed in Chauvenet's or Brünnow's works on Spherical and Practical Astronomy, and including such portions of Theoretical Astronomy (such as Watson's) as are not especially concerned with the determination of orbits. Professor RICE.

52. On the Theory and Practice of Interpolation. A special course, including a full discussion of the properties of differences, the various formulæ and methods of interpolation, tabular differentiation, and mechanical quadrature; also other important problems concerned with the tabular values of functions, for those desiring special acquaintance with this fundamental and important subject. Professor RICE.

53. A reading course in the History of Astronomy. Such works as Grant's History of Physical Astronomy, Clerke's History of Astronomy during the Nineteenth Century, etc., will be used as texts. Professor RICE.

#### ASTRO-PHYSICS.

FRANK HAGAR BIGELOW, A. M., L. H. D., Professor of Astro-Physics.

##### *Third Section. Primarily for Graduates.*

40. Solar Magnetism. The constitution of the sun, the solar corona, the prominences, the faculæ, the sun-spots and allied phenomena in solar physics, and the grounds for the theory that the sun is a polarized sphere surrounded by a magnetic field, which is associated with these phenomena.

41. Cosmical Electricity and Magnetism. The two fields of force emanating from the sun, their mode of propagation through the ether, the theory of magnetic and electro-magnetic fields in connection with the theories of light, heat, and ether wave motions. Authors: Maxwell, Poincaré, J. J. Thomson, A. G. Webster, Watson, and Burbury, with references to the recent literature in scientific journals.

42. Terrestrial Magnetism. The distribution of the permanent magnetism of the earth, its disturbance by the solar fields, magnetic instruments, observatories and methods of observation, magnetic storms, the aurora, and atmospheric electricity, with a history of the progress of the science of each portion. Authors: Gauss, Mascart, Stewart, and Gee, the reports of observatories and recent scientific papers.

43. Meteorology. The thermodynamic theory of the distribution of the atmosphere, the motions of the same, the periodic variations due to the solar fields, and the long-range predictions of the weather. A statement will be made of the latest progress in the development of this branch of physics, together

with the allied questions of atmospheric absorption and transmission of energy, ionization of gases, including important contributions of physical laboratories bearing on these subjects.

The results of the International Cloud Survey of the upper air; a comparative study of the theories of dynamic meteorology; Bigelow's standard system of equations useful in meteorology; the gradients of pressure, temperature, and vapor tension as determined by cloud observations, balloon and kite ascensions; the barometry of the United States; eclipse meteorology and allied problems; the new cosmical meteorology; these and related topics are included in this course.

#### BOTANY.

O. F. COOK, Ph. B., Professor of Botany.

JOHN CLEVELAND WELSH, M. S., Instructor in Botany.

Preparatory work should include a year's course in the elements of the Morphology, Physiology, Ecology, and Classification of Plants. Students should be acquainted with the structure, habits, and natural history of one or more representatives of each of the primary groups of plants. They should be able to use the more important botanical terms with precision, should be familiar with the methods of study of one or more of the principal subdivisions of the science, and should know something of the nature and scope of the principal works of reference, especially those pertaining to American botany.

##### *First Section. Primarily for Undergraduates.*

1. General Botany. Plants viewed from the general-culture standpoint. Illustrations of principal types of structure and function. History and methods of botanical research. Natural history and uses of plants. Practical applications of botanical knowledge. Monday and Friday, at 5.40. Mr. WELSH.

##### *Second Section. For Undergraduates and Graduates.*

20. Systematic Botany. Purposes and methods of biological taxonomy as affording a necessary vocabulary and index of facts. Natural or phylogenetic arrangement. Systems and categories of classification. Rules of nomenclature. Works of reference. Herbarium methods. Collection and preservation of specimens in the various natural groups. Systematic

study of some part of the local flora. Lectures, laboratory and field work. Monday, Wednesday, and Friday, at 4.50. Professor COOK and Mr. WELSH.

21. Structural Botany. Comparative studies of the morphology and histology of representatives of the principal types of plant structure. Lectures and laboratory work. Tuesday, Thursday, and Saturday, at 4.50. Mr. WELSH.

22. Physiological Botany. Comparative study of the methods by which nutrition, growth, reproduction and other vegetative functions are accomplished in the different natural groups. History, methods and problems of physiological experiments with plants. Lectures and laboratory work. Tuesday, Thursday, and Saturday, at 4.50.

23. Geographical Botany. The distribution of plants in nature. Methods of dissemination and their efficiency. Geographical origins and histories of various orders and families. Lectures and research work; to follow courses 20 and 21. Wednesday and Friday, at 4.50.

24. Developmental Botany. The facts of plant development as illustrations of the nature of the evolutionary process. Development and relationships of the principal types. Lectures and seminar work; to follow courses 20, 21 and 22. Tuesday and Thursday, at 5.40. Professor COOK.

25. Economic Botany. The Uses of Plants. Aboriginal Botany. Origin and distribution of cultivated plants and agricultural industries. Applications of Botany to agricultural problems. Lectures and research work. Wednesday and Saturday, at 5.40. Professor COOK.

*Third Section. Primarily for Graduates.*

40. Special Research Courses.

41. Thesis Work. Candidates for higher degrees who elect Botany as a major subject must present an outline of a proposed original investigation, showing methods to be followed and ends to be sought. In planning, executing, and presenting the results of the investigation, evidences of insight, constructive ingenuity, practical resourcefulness, and general scientific interest will be expected, not merely applications to other plants of methods and theories already elaborated.

CHEMISTRY.

CHARLES E. MUNROE, Ph. D., Head Professor of Chemistry.

FRANK WIGGLESWORTH CLARKE, Sc. D., Professor of Mineral Chemistry.

HARVEY W. WILEY, Ph. D., M. D., Professor of Agricultural Chemistry.

THOMAS M. CHATARD, Ph. D., Lecturer on Chemical Engineering.

N. MONROE HOPKINS, Ph. D., Assistant Professor of Chemistry.

EDWIN A. HILL, Ph. D., Instructor in Chemistry.

THOMAS M. PRICE, Ph. D., Instructor in Chemistry.

CLARENCE HALL, Assistant in Assaying.

\*RAYMOND OUTWATER, Assistant.

WALTER OTHEMAN SNELLING, Assistant in Chemistry.

*First Section. Primarily for Undergraduates.*

1. General Chemistry. A series of illustrated lectures, accompanied by recitations and exercises, on theoretical, inorganic, organic, and technical chemistry. Tuesday, Thursday, and Saturday, at 4.50. Professor MUNROE.

2. Laboratory Practice. A laboratory course for the study of the principles of chemistry and the methods of conducting chemical experiments. Two two-hour periods. Tuesday and Thursday, at 1.30. Professor MUNROE, Asst. Professor HOPKINS, Dr. HILL, Mr. SNELLING.

3. Preparation and Study of the Properties of Chemical Substances. A laboratory course. Two two-hour periods. Tuesday and Thursday, at 1.30. Professor MUNROE, Dr. PRICE, Mr. SNELLING.

4. Assaying and Metallurgy of the Precious Metals, carried on by the methods used by the Government assayers, the laboratory being fitted up on the plan of that of the United States Mint. Twelve hours, for three months. Professor MUNROE, Mr. HALL.

5. Lectures on the Principles of Analysis. One hour. Professor MUNROE.

6. Metallurgy of Iron and Steel. A course of lectures and readings. Tuesday, at 5.40. Professor MUNROE.

*Second Section. For Undergraduates and Graduates.*

20. Qualitative Analysis. A laboratory course in the study of the properties and reactions of chemical substances, and of the

\* Resigned March 17, 1904.

means employed for their detection and identification. Four two-hour periods. Professor MUNROE, Dr. PRICE, Mr. SNELLING.

21. Quantitative Analysis. A laboratory course in the quantitative estimation of the constituents of a specially selected and typical set of chemical substances, which are particularly adapted for teaching the student the aims and methods of quantitative chemical analysis and for imparting facility in manipulation. Six two-hour periods. Professor MUNROE, Dr. PRICE, Mr. SNELLING.

22. Technical Analysis and Industrial Processes. A lecture and laboratory course in which the elements of chemical engineering are taught, and special attention is given to rapid commercial methods of analysis. Two six-hour periods. Professor MUNROE.

23. Advanced course in Organic Chemistry. Wednesday and Friday, at 4.50. Professor MUNROE.

24. Advanced course in Organic Chemistry. A continuation of Course 23. Thursday and Saturday, at 5.40. Professor MUNROE.

25. Chemistry of the Carbon Compounds. A laboratory course in the preparation and study of the properties of a characteristic series of organic compounds. Six two-hour periods. Professor MUNROE, Dr. PRICE, Mr. SNELLING.

26. Electro-chemistry. This course treats of the modern theories of chemistry, to which is added the consideration of the more important technical applications of electricity to chemistry. Monday and Friday, at 5.40. Asst. Professor HOPKINS.

27. Stereo-chemistry. This course deals with the arrangements of atoms in space from a theoretical standpoint, while the student is taught how to form models by which to illustrate their arrangements. Monday, at 4.50; Wednesday, at 5.40. Dr. HILL.

*Third Section. Primarily for Graduates.*

40. Explosive Substances. Professor MUNROE.

41. Analytical Methods. Professor MUNROE.

42. The Phenomena of Deliquescence and Efflorescence. Professor MUNROE.

43. Development of the Theory of the Constitution of the Natural Silicates. Professor CLARKE.

44. The Redetermination of Atomic Weights. Professor CLARKE.

45. Special Researches in Agricultural Chemistry. Professor WILEY.

### CIVIL ENGINEERING.

HENRY A. PRESSEY, B. S., Professor of Civil Engineering.

\* R. E. NELSON, JR., Instructor in Civil Engineering.

BERNARD HERMAN, B. S., Instructor in Civil Engineering.

FRANCIS R. WELLER, B. S., Instructor in Civil Engineering.

#### *First Section. Primarily for Undergraduates.*

1. Land and Topographical Surveying, with theory and use of instruments. Practical Exercises and Field-work, not less than sixty hours during the session. Johnson's Surveying. Monday and Saturday, at 5.40. Mr. WELLER.

2. Railroad and Highway Engineering. Field-work as in course 1. Allen's Railroad Curves and Earthwork. Searle's Field-book. Judson's Highway Construction. Monday, at 5.40; Tuesday, at 4.50. Professor PRESSEY, Professor THURSTON.

3. Sanitary Engineering (Water Supply and Sewerage). Folwell's Water Supply Engineering. Folwell's Sewerage. Monday and Wednesday, at 4.50. Design. Two hours. Professor PRESSEY.

4. Materials of Construction. Wednesday and Friday, at 5.40. Exercises. One hour.

#### *Second Section. For Undergraduates and Graduates.*

20. Masonry Construction. Friday, at 4.50. Constructive Exercises. Baker's Masonry Construction. Two hours. Mr. HERMAN.

21. Hydraulic Engineering (Rivers, Water Power, and Irrigation). Frizell's Water Power. Wilson's Irrigation Engineering. Saturday at 4.50. Constructive Exercises. One hour. Professor PRESSEY.

\* Resigned February 1, 1904.

22. Framed Structures. Johnson's Framed Structures. Monday, Wednesday, and Friday, at 4.50. Design. Two hours. Mr. HERMAN.

*Third Section. Primarily for Graduates.*

40. Water Supply. Details of water works. Study of surface and underground waters as sources of supply, with special reference to methods of purification. Professor PRESSEY.

41. Sewerage. Details of sewerage systems, with special reference to methods of sewage disposal. Professor PRESSEY.

42. Hydrology. Flow of rivers, rainfall, and the effects of topography, forests, etc., upon the run-off of watersheds. Professor PRESSEY.

43. Irrigation. Professor PRESSEY.

44. Advanced course in the graphic statics of building construction.

45. The theory of suspension, continuous, cantilever, and braced arched bridges, with a more complete course in the design of plate girders, riveted and pin-connected bridges, with working drawings and estimates.

46. Advanced course in construction. The theory and designing of retaining walls, masonry arches, and dams.

47. Thesis, the subject of which is to be selected by the student and approved by the Professor of Civil Engineering.

CLASSICAL LANGUAGES.

MITCHELL CARROLL, A. M., Ph. D., Head Professor of Classical Philology.

CHARLES S. SMITH, A. M., Assistant Professor of Greek and Latin.

PAUL NOBLE PECK, Assistant in Greek and Latin.

GREEK.

*First Section. Primarily for Undergraduates.*

1. Lysias (selected orations); Herodotus (selections); Greek prose composition. Monday, Wednesday, and Friday, at 2.30. Asst. Professor SMITH.

2. Euripides (Alcestis, Medea). Tuesday, at 3.30. Asst. Professor SMITH.

3. Thucydides (Book VII); Æschylus (Seven against Thebes); Demosthenes (Olynthiacs and Philippics); Sophocles (Antigone). Private reading. Monday, Wednesday, and Friday, at 11.30. Professor CARROLL and Asst. Professor SMITH.

*Second Section. For Undergraduates and Graduates.*

20. Plato (Apology, Crito, Phædo); Aristophanes (Clouds); The Idylls of Theocritus. Conferences in history of Greek literature. Tuesday and Thursday, at 9.30. Professor CARROLL.

21. Greek Prose Composition (advanced course).—Practical oral exercises in syntax and translation. Original composition. Thursday, at 11.30. Professor CARROLL.

22. Greek Literary Criticism: Aristophanes (Frogs); Aristotle (Art of Poetry); Longinus (on the Sublime); Greek Lyric Poetry. Tuesday and Thursday, at 1.30, second term. Not given in 1904-05. Given in 1905-06.

LATIN.

*First Section. Primarily for Undergraduates.*

1. Livy (Books I, XXI); Cicero (de Senectute); Cicero and Pliny (Selected Letters); Latin Prose Composition. Monday, Wednesday, and Friday, at 3.30. Asst. Professor SMITH.

2. Horace (Odes and Epodes). Thursday, at 3.30. Professor CARROLL.

3. Tacitus (Agricola, Germania, Selections from the Annals); Satires and Epistles of Horace; Juvenal (Selections). Private reading. Monday, Wednesday, and Friday, at 3.30. Professor CARROLL and Asst. Professor SMITH.

*Second Section. For Undergraduates and Graduates.*

20. Cicero's Tusculan Disputations; Lucretius; Vergil (Bucolics and Georgics). Tuesday and Thursday, at 10.30. Professor CARROLL.

21. Roman Literary Criticism: Quintilian (Book x) and Horace (Ars Poetica); Catullus and the Elegiac Poets (Tibullus, Propertius, Ovid). Conferences on History of Roman Literature. Tuesday and Thursday, at 10.30. Not given in 1904-05. Given in 1905-06.

22. Latin Composition and Reading at Sight. Practice in Latin expression and style. Original essays in Latin. One hour. Tuesday, at 1.30. Asst. Professor SMITH.

23. Plautus and Terence. Thursday, at 1.30. Asst. Professor SMITH.

NOTE.—Students in Greek and Latin are recommended to take as electives the following courses in Classical Archaeology:

20. Topography and Monuments of Athens and Rome. Given in 1906-07.

21. Private Life of the Greeks and Romans. Given in 1905-06.

22. Greek and Roman Architecture and Sculpture. Given in 1904-05.

*Third Section. Primarily for Graduates.*

THE SEMINARY OF CLASSICAL PHILOLOGY.

Professor CARROLL, Director.

The design of the Seminary of Classical Philology is to afford discipline in the methods of philological criticism and research with especial reference to the interpretation of classical authors. It is composed of all graduate students in Classical Languages, and is under the supervision of the Director, who is assisted by the other instructors of the department in certain features of the work. Each year two authors in related branches of Greek and Latin literature are made the center of study. Interpretations of the texts under consideration are prepared by the members, and papers are read by them from time to time, containing the results of special study of philological or literary topics. Furthermore, wide and systematic reading in the authors selected is carried on under personal supervision, and special lectures are given from time to time on the departments of literature involved. The authors selected for criticism and interpretation in 1903-04 are: Greek 40, Thucydides; Latin 40, Tacitus. Two meetings of an hour and a half each will be held weekly at assigned hours.

THE CLASSICAL CLUB.

The Columbian Classical Club, which is composed of instructors and advanced students in Greek and Latin and clas-

sical archaeology, meets monthly for the more detailed discussion of special topics in ancient life, literature, and art than is ordinarily possible in the class-room. At each meeting a paper is read, reviews of recent classical publications are presented, and reports are made from the various sites of archaeological excavation. Teachers and patrons of the classics in Washington are admitted as associate members, and at open meetings the club avails itself, when possible, of the services of eminent scholars from other universities who may be temporarily in the city.

### ECONOMICS.

ROLAND P. FALKNER, Ph. D., Professor of Economics.

#### *First Section. Primarily for Undergraduates.*

1. Elementary Economics. Walker's Political Economy, Advanced Course. Wednesday and Friday, at 5.40.

*The work in Economics is to be enlarged and additional courses offered. Announcements will be made in a later bulletin.*

### ELECTRICAL ENGINEERING.

FRANK A. WOLFF, Ph., D., Professor of Electrical Engineering.

PHILANDER BETTS, E. E., Instructor in Electrical Engineering.

A. B. MARVIN, JR., B. S., Instructor in Electrical Engineering.

#### *First Section. Primarily for Undergraduates.*

1. Elementary Mathematical Theory of Electricity and Magnetism. Text-book: S. P. Thompson's Elementary Lessons in Electricity and Magnetism. Monday and Wednesday, at 5.40. First term. Professor WOLFF.

2. Dynamo-electrical Machinery. Text-book: Hawkins and Wallis, The Dynamo. Monday and Wednesday, at 5.40; Thursday and Saturday, at 4.50. Second term. Mr. BETTS.

3. Electrical Measurements. A laboratory course for students in the Electrical Engineering Course. Text-book: Carhart and Patterson's Electrical Measurements. Three two-hour periods. Mr. MARVIN.

#### *Second Section. For Undergraduates and Graduates.*

20. Advanced Mathematical Theory of Electricity and Magnetism. Text-book: Gerard's Electricity and Magnetism

(translated by Duncan). Monday, Wednesday, and Friday, at 4.50. First term. Professor WOLFF.

21. Dynamo-electric Machinery. Advanced Course. Text-books: S. P. Thompson's *Dynamo-electric Machinery and Polyphase Currents*; Jackson's *Alternating Currents*. Monday, Wednesday, and Friday, at 4.50. Second term. Professor WOLFF and Mr. BETTS.

22. Technical Applications of Electricity. A course covering the most important applications of electricity: Telephony, Telegraphy, Lighting, Power Transmission, Electro-metallurgy, Electro-chemistry, etc. Wednesday and Saturday, at 5.40. Special lecturers.

23. Advanced Laboratory Work for students in the Electrical Engineering Course. Three two-hour periods. Mr. BETTS.

24. Inspection of Electric Light and Power Plants, etc. In the vicinity of Washington and Baltimore are a number of modern electric-lighting and street-railway plants, telephone exchanges, telegraph operating-rooms, etc., which afford students of electrical engineering an excellent opportunity to familiarize themselves with nearly all types of electrical apparatus in use. The visits are followed by a class discussion. Occasional meetings are held at which papers on special subjects are read by advanced students. Mr. BETTS.

Juniors and Seniors in Electrical Engineering are required to attend the monthly meetings of the Washington branch of the American Institute of Electrical Engineers, held at the University.

### *Third Section. Primarily for Graduates.*

40. Technical Applications of Electricity. A course of special lectures on the most recent and most important applications of electricity to industrial and scientific use. Two hours.

41. Design of Direct and Alternating Current Machinery. Two hours.

42. Advanced Course in the Mathematical Theory of Alternating Currents. Three hours, first term. Professor WOLFF.

43. Advanced Course in Polyphase Currents. Three hours, second term. Professor WOLFF.

44. Advanced Laboratory Work, Alternating (including Polyphase) Current apparatus. Three two-hour periods.

ENGLISH.

WILLIAM ALLEN WILBUR, A. M., Head Professor of English.  
HARRY LUDWIG COLESTOCK, Assistant in English.

*First Section. Primarily for Undergraduates.*

1. Rhetoric. This course presupposes a knowledge of the elements of rhetoric. The objects of the course are: an exposition of the principles of rhetoric; a verification of these principles by the analysis of selections from the best writers, with definite practical deductions to guide in criticism and composition; the application of these principles in theme writing. Text-book: Genung's Working Principles of Rhetoric. Tuesday and Thursday, at 9.30. Professor WILBUR and Mr. COLESTOCK.

2. Rhetoric. Identical with Course 1. Monday and Friday, at 4.50. Professor WILBUR and Mr. COLESTOCK.

3. Prose. A critical study of representative prose works in a chronological order, ranging from Roger Ascham to Robert Louis Stevenson. The intent of the course is by inductive and comparative studies to show the development of a standard prose style and the main tendencies of change in the standard through three centuries. This course requires the careful study of about twenty books. It is open to students who have passed in Course 1 or 2. Monday, Wednesday, and Friday, at 10.30.

4. English Literature. A course of lectures tracing the historical development of the literature with the design of giving a general view of the literature of England and emphasizing its consistency in the persistence of a certain distinctive quality. Students taking this course will read a few selected books. Wednesday, at 4.50.

5. American Literature. Lectures and class studies in biography and literature. Students taking this course are required to read widely in the literature. Wednesday, at 5.40.

*Second Section. For Undergraduates and Graduates.*

20. Composition. An advanced course. Paragraph making and studies in criticism. Essays are written weekly: These are exchanged and criticisms are written during the hour; essays and criticisms are finally revised and returned. Wendell's

English Composition is used as a handbook. The course is open to students who have passed in Course 1 or 2. Tuesday, at 1.30.

21. Old English. An elementary course; the essentials of the grammar and readings from Old English texts. Text-books: Cook's First Book in Old English; Cook's Exercises in Old English. Tuesday and Thursday, at 2.30.

22. Shakespeare. The Comedies and Romances. Given in 1904-05. Monday, Wednesday, and Friday, at 1.30. The Temple edition of Shakespeare is recommended.

23. Shakespeare. The Tragedies and Romances. Given in 1903-04. Not given in 1904-05. Monday, Wednesday, and Friday, at 1.30.

27. The English Novel. Development of the Novel, with critical studies of selected works, including some contemporary fiction. Given in 1904-05. Monday and Friday, at 5.40.

28. Tennyson. The poetry of Tennyson. Given in 1903-04. Not given in 1904-05. Monday and Friday, at 5.40.

*Third Section. Primarily for Graduates.*

40. English Philology. One hour.

41. The English Drama. Given in 1903-04. Not given in 1904-05. One hour.

43. Shakespeare. One hour.

Special topics of graduate study may be pursued under the direction of the department. The following courses of research are suggested:

50. The Elements of Style.

51. The Phenomena of Personality in Composition and in Literature.

52. The Arthurian Legends: Their expression, development, and significance in English literature.

53. English Romanticism, with particular reference to the beginnings of the romantic movement in the eighteenth century.

## GEOLOGY AND MINERALOGY.

GEORGE P. MERRILL, Ph. D., Professor of Geology and Mineralogy.

TIMOTHY W. STANTON, A. M., Ph. D., Instructor in Paleontology and Stratigraphical Geology.

MAYVILLE W. TWITCHELL, M. S., Instructor in Mineralogy.

### *First Section. Primarily for Undergraduates.*

1. Mineralogy. Crystallographic, descriptive, and determinative mineralogy. This course is designed with especial reference to minerals as rock constituents or segregated as ore deposits. It includes, therefore, a discussion of not merely the crystallographic and theoretical, but the practical side of the subject as well. Whenever possible, it should be considered as introductory to the courses in either systematic or economic geology. Tuesday and Thursday, at 5.40.

2. Geology. Systematic geology: dynamical, structural, and stratigraphical. The course is designed to form a part of a general culture course, or a preliminary course for those intending to make a specialty of geology. It includes lectures, recitations, laboratory and field work. Paleontology is treated as a branch of geology, having especial reference to stratigraphy and correlation. Text-books: Scott's Introduction to Geology; Merrill's Rocks, Rock Weathering and Soils. Monday and Friday, at 5.40.

### *Second Section. For Undergraduates and Graduates.*

20. Economic Geology. The course consists largely of lectures upon the subjects comprised under: (1) Mineral veins and metalliferous deposits, their mode of occurrence, origin, and classification; (2) the ores of iron, copper, lead, zinc, tin, silver, gold, mercury, antimony, etc.; and (3) the non-metallic minerals, as the coals and hydrocarbon compounds; salts and materials used in chemical manufactures; abrasive, refractory, and fictile materials, pigments, gems, ornamental stones, building stones, limes, cements, and mineral waters. Text-books: Kemp's Ore Deposits of the United States; Merrill's Stones for Building and Decoration, and the Non-metallic Minerals. Monday and Friday, at 4.50.

### *Third Section. Primarily for Graduates.*

Advanced study in Geology, both systematic and applied, is arranged to cover two years.

40. Advanced Geology. The student in this first-year course may devote his time largely, if necessary, to perfecting himself in methods; to general work in the laboratory and in the field; to the examination of geological materials, and to familiarizing himself with the literature of the subject. The utility of the various text-books is recognized, but a very large portion of the desired knowledge on any subject must be gained from special memoirs and from the current literature as it appears in numerous periodicals. The various sources of information, the most essential lines of work, as well as the most promising fields of investigation, are from time to time indicated by the instructor.

41. Advanced Geology: A continuation of Course 40. The student is expected to devote himself to some special investigation which shall serve as the subject of his thesis. The course is modified to suit individual cases, in order that the student may be restricted as little as possible in the exercise of personal taste, originality, and capacity for work.

#### GERMAN.

HERMANN SCHOENFELD, Ph. D., LL. D., Head Professor of German.

CARL HAU, A. M., Instructor in German.

#### *First Section. Primarily for Undergraduates.*

Instruction in German has, as its primary object, a thorough knowledge of the grammar and familiarity with the general literature and history, with such practice in conversation as shall serve as a stimulus in the furtherance of this object. The principles of grammar are illustrated from the class readings and composition.

1. A preliminary course in grammar, narrative prose, the elements of historical reading, and select poems of the principal modern poets. Special stress is laid on exercises in composition. One classic (Schiller) is studied. The work done is equivalent to a two years' course in high schools or academies of good standing. Monday, Wednesday, and Friday, at 11.30. Professor SCHOENFELD and Mr. HAU.

2. Identical with Course 1, with the addition of material tending to train students in the sciences. Tuesday, Thursday, and Saturday, at 4.50. Professor SCHOENFELD and Mr. HAU.

3. The deeper aspects of grammar; accurate training in phonetics and translation into German; conversation; readings from the best German prosaists and poets; selected texts from Schiller, Lessing, Goethe, Freytag, and the foremost recent authors. Beginnings of German literature and history. Special preparation for scientific professional work. Open to students who have passed Course 1 or 2, or have fulfilled the entrance requirement in Elementary German. Monday, Wednesday, and Friday, at 3.30. Professor SCHOENFELD and Mr. HAU.

4. Identical with Course 3. Tuesday, Thursday, and Saturday, at 5.40. Professor SCHOENFELD and Mr. HAU.

5. Advanced course in German syntax; principal difficulties of the language; idioms; synonyms; extensive translation of the best English prosaists into German; essays; selected advanced prose; classical reading and literature; German history. Special training for advanced students in the historic and economic departments. Open to students who have passed Course 3 or have fulfilled the entrance requirement in Advanced German. Monday, Wednesday, and Friday, at 1.30. Professor SCHOENFELD.

*Second Section. For Undergraduates and Graduates.*

20. German Literature in the first half of the nineteenth century; its social and political aspects; the Romantic School; classicism till Goethe's death; essays, lectures, and collateral reading. Tuesday and Thursday, at 11.30. Professor SCHOENFELD.

21. Literary awakening in Germany in the time of Frederick the Great; critical study of the literary centers—Leipzig, Zürich, Göttingen, Berlin. The Storm and Stress Period and the youthful works of Schiller and Goethe; critical investigation of Klopstock's Odes; Messias. Tuesday and Thursday, at 3.30. Professor SCHOENFELD.

The intervening periods of Modern German Literature will be studied during the subsequent academic year.

*Third Section. Primarily for Graduates.*

40. German Literature in the sixteenth century. Braune's Neudrucke Deutscher Literaturwerke. Humanism and Reformation, with special reference to Italian and French influences.

Historical basis after Voigt, Janssen, Ranke, Burckhart, Geiger, etc. One hour. Professor SCHOENFELD.

41. German Literature in the twelfth and thirteenth centuries, with special regard to the Nibelungen lay and the Gudrun saga. The lyrics of Walther von der Vogelweide. The grammatical aspects of the classics of the First Period of Bloom. Two hours. Professor SCHOENFELD.

The other phases of older German literature and philology will be studied in subsequent years, so that the general range of the history of German Literature may be covered every three years.

45. The emerging of the Germanic, Romance, and Slavic races in European History. The Migration of Peoples. The Evolution of European States to the rise of the Hapsburg House. (Selections from the historical sources will be read and interpreted.) Professor SCHOENFELD.

46. The Holy Roman Empire from Rudolph of Hapsburg till the death of Maximilian I (1519), with special reference to *Kulturgeschichte*, and the first attempts at Church reform. Professor SCHOENFELD.

47. The Political awakening in the Eighteenth Century. Causes of the French Revolution and origins of the Napoleonic Empire. Professor SCHOENFELD.

48. The Annihilation and Reconstruction of Prussia (H. von Treitschke, etc.). The Building up of the Modern German Empire (H. von Sybel, etc.). Professor SCHOENFELD.

## GRAPHICS.

ERNEST L. THURSTON, C. E., Professor of Graphics.

EDWARD ADAMS MUIR, B. S., Assistant Professor of Graphics.

LOUIS E. GILES, B. S., Instructor in Graphics.

### *First Section. Primarily for Undergraduates.*

1. Mechanical Drawing. A course designed to give a knowledge of the fundamental principles of mechanical drawing and to prepare for higher technical drawing. A study of geometrical and graphical constructions, including higher curves; elementary orthographic and isometric projections, sections, and intersections; dimensioning, lettering, and conventional symbols; first principles of working drawings and tracings.

Monday and Friday, at 5.40, with supplementary exercises. Professor THURSTON and Mr. GILES.

2. Machine Drawing. A general course in reading drawings and in drawing-room practice, including: A study of the names and arrangement of views and sections; conventional methods and the nomenclature of machine parts; practice in describing the machine and its operation from the drawing. One hour (special students, two hours). Asst. Professor MUIR.

3. Machine Drawing. A course designed especially for mechanical and electrical engineering students. Projections of intersections and development of surfaces; conventional forms, rules, etc.; the construction and reading of working drawings. Two two-hour periods for one term. Friday and Saturday, at 5.40.

For advanced students additional work is offered during the second term, including the construction of working drawings and sketches from models; detailing from general drawings; tracing and blue printing; designing by means of graphic methods and empirical formulæ. Asst. Professor MUIR.

8. Descriptive Geometry. A study of the representation of lines, surfaces, and solids, and of their relations; tangencies, intersections, and developments; warped surfaces; shades and shadows; original construction problems. Tuesday and Thursday, at 5.40; supplementary exercises, two hours. Professor THURSTON.

9. Lettering as applied to Mechanical, Topographic, and Architectural Drawing. Two hours.

10. Topographic Drawing. A general course, including: hypsographic expressions; topographic, cadastral, and public culture symbols; scales and plotting; projections, reductions, and enlargements; compilation, plain and in color. Two hours, with supplementary exercises. Professor THURSTON.

*Second Section. For Undergraduates and Graduates.*

20. Graphic Statics. Principles and methods, including the construction and use of load, stress, and moment diagrams; dead, live, snow, and wind loads; the graphic analysis of simple beams, girders, roof trusses, and bridge trusses; simple designing. Thursday and Saturday, at 4.50; supplementary exercises, two hours. Professor THURSTON.

21. Mechanics of Machinery ; the graphical statics of mechanism. Wednesday and Saturday, at 5.40. Professor THURSTON.

*Third Section. Primarily for Graduates.*

40. Geometry of Position. A study of the subject as developed by projective methods based on the works of von Staudt, Steiner, etc. Professor THURSTON.

41. Graphic Statics. This science may be studied :

(1) As a part of Applied Mechanics, based on the works of Culmann, Ritter, Koechlin, Chambers, etc.

(2) As a part of Analytic Mechanics, based on geometry of position. Professor THURSTON.

42. Systems of Projection. A comparative study of the theories and principles of known systems, with their applications to technical drawing and map projection. Professor THURSTON.

45. The History and Development of Technical Drawing from earliest times. Class and research work. Professor THURSTON.

## HISTORY AND POLITICAL SCIENCE.

CHARLES CLINTON SWISHER, Ph. D., Head Professor of History and Professor of Political Science.

L. RUSSELL ALDEN, A. B., Assistant in Mediæval and Modern European History.

### HISTORY.

*First Section. Primarily for Undergraduates.*

1. Mediæval History. A general survey of the more important phases of the history of Europe from the Teutonic invasion to the Fall of Constantinople. Text-book, lectures, and collateral reading. Tuesday and Thursday, at 10.30. Mr. ALDEN.

2. Modern European History. A history of the European States under the new conditions brought into action by the Protestant Revolution, the invention of printing, and the discovery of America to the period of the French Revolution.

Text-book, lectures, and reports. Tuesday and Thursday, at 11.30. Mr. ALDEN.

3. A preliminary discussion of the sources and materials of history, historical literature and geography, and the purpose and methods of historical study. Lectures. Tuesday, at 11.30. Professor SWISHER.

*Second Section. For Undergraduates and Graduates.*

20. European History since the close of the French Revolution. An introductory study to contemporaneous politics. Lectures, examinations, and collateral reading. Tuesday and Thursday, at 4.50. Professor SWISHER.

21. English History. With special reference to economic and social changes and later commercial expansion. Text-books, reports, and collateral readings. Open to students who have taken Course 20. Tuesday and Thursday, at 3.30. Professor SWISHER.

22. American History. Social and economical conditions of the English colonists in America leading to political differentiation and subsequent revolution. The acquisition of new territory, and national development under the Constitution. Text-book, reports, and collateral reading. Open to students who have taken Course 20. Wednesday and Friday, at 3.30. Professor SWISHER.

23. English Constitutional History. Parliamentary usages developed under the Normans and early Plantagenets; in abeyance under the Tudors; triumphant under the later Stuarts. The rise of party government under the Whig oligarchy of the Revolution until triumph of the democracy in the reforms of the nineteenth century. Lectures, discussion, and collateral reading. Open to students who have completed Courses 21 and 22. Tuesday and Thursday, at 2.30. First term. Professor SWISHER.

24. American Constitutional History. Constitutional development traced through colonial charters and "Articles of Confederation" until formulated in the Constitution of 1789. Interpretation of the Constitution, under the pressure of party issues, through the period of division and reconstruction. Lectures, discussion, and collateral reading. Open to those who have completed Courses 21, 22, and 23. Tuesday and Thursday, at 2.30. Second Term. Professor SWISHER.

25. History of the British Empire. Evolution of the imperial idea; colonial expansion of England; England in Asia, America, Australasia, and Africa; the problem of imperial federation. Lectures and collateral reading, open to students who have completed Course 20. Monday, at 9.30. Professor SWISHER.

#### POLITICAL SCIENCE.

##### *Second Section. For Undergraduates and Graduates.*

20. The Historical Basis of Political Institutions. The genesis, development, and differentiation of political institutions under the influence of local environment, with special study of Athenian democracy, Roman imperialism, and the blending of Roman and Teutonic institutions in the Feudal system. Lectures, conferences, and examinations. Tuesday, at 5.40. Professor SWISHER.

21. The Evolution of the Modern States. The progress of Centralization and the development of National Consciousness; Revolution and Subsequent reconstruction, with a study of the resulting political institutions, especially in England, Germany, France, Switzerland, and the United States. Thursday, at 5.40. Professor SWISHER.

22. An Analytical Study of the Functions and Structure of Political Institutions. Topical reading and discussion by the Class. Wednesday, at 2.30. Professor SWISHER.

23. A study of the Practical Working of the United States Government; its administrative efficiency compared with that of the governments of England and the Continental States. Topical reading and discussion by the class. Friday, at 2.30. Professor SWISHER.

#### HISTORY AND POLITICAL SCIENCE.

##### *Third Section. Primarily for Graduates.*

Graduate Seminars in History and Political Science will be held weekly for the arrangement of special courses, and the direction and prosecution of individual research.

LIBRARY SCIENCE.

WILLIAM P. CUTTER, B. S., Professor of Library Science.

AINSWORTH R. SPOFFORD, LL. D., Lecturer on Library Science.

ALICE F. STEVENS, Assistant in Library Science.

*First Section. Primarily for Undergraduates.*

1. Lectures on Library Science.

1. Introduction—Objects of a Course of Library Science.
2. The Art of Printing.
- 3-5. The History of Printing, by countries (3 lectures).
6. The Genesis of Libraries.
- 7-10. The History of Libraries, by nations and States (4 lectures).
11. The Uses of Libraries.
12. The Choice of Books.
13. Methods of Reading.
14. Memory and its So-called Aids.
15. Helps to Readers.
16. Book-buying for Libraries.
17. The Preservation of Books, restoring, &c.
- 18-19. Bookbinding (2 lectures).
20. Periodical Literature.
21. The Literature of Pamphlets.
- 22-27. Qualifications of Librarians (6 lectures).
28. Library Buildings and Furnishings.
29. Library Regulations.
30. Library Trustees or Boards of Directors.
31. Libraries and the Public Press. DOCTOR SPOFFORD.

2. Cataloging.

These lectures will cover the elementary cataloging methods used in making dictionary catalogs, familiarizing the students with the choice of subject headings, the equipment and cost of a card catalog, including the distribution of cards from a central bureau and the printing and issue of finding lists and library accession lists. The lectures are supplemented by practice carried on in the Library of Congress. PROFESSOR CUTTER and MISS STEVENS.

3. Classification and Shelf Department Work.

The Decimal system and the Expansive system will be discussed and compared, and practice given in classifying books

by both systems. Instruction will be given in the preparation of a shelf list, both on cards and sheets, and in the preparation of books for the shelves. Lectures supplemented by practice carried on in the Library of Congress. Professor CUTTER and Miss STEVENS.

#### 4. Library Administration.

This will include loan systems, including inter-library loans, borrowers' registers, and statistics of readers; accounts, stock-taking, care of supplies; library legislation, library associations, clubs, commissions, library schools, and traveling libraries. Lectures supplemented by practice carried on in the Library of Congress. Professor CUTTER and Miss STEVENS.

#### 5. Accession and Order Department Work.

This will include the various details in the acquisition of books, book prices, reading second-hand catalogs, the organization of the book trade, book trade publications; the preparation of an accession book and of statistics of accession. Lectures supplemented by practice carried on in the Library of Congress. Professor CUTTER and Miss STEVENS.

*An ordinance of the Board of Trustees of the University, adopted February 20, 1904, has established a new Department of Bibliology and Library Science. This ordinance is to go into effect when a sufficient endowment has been secured.*

### MATHEMATICS.

JAMES HOWARD GORE, Ph. D., Head Professor of Mathematics.

HOWARD LINCOLN HODGKINS, Ph. D., Professor of Mathematics.

FRANK GUSTAVE RADELFINGER, B. S., Assistant Professor of Mathematics.

#### *First Section. Primarily for Undergraduates.*

1. Solid Geometry; Gore's Plane and Solid Geometry. Monday, Wednesday, and Friday, at 9.30, for two months. Professor GORE.

2. Geometry; Gore's Plane and Solid Geometry. Tuesday and Thursday, at 5.40. Professor HODGKINS.

3. Algebra; Bowser's College Algebra. Monday, Wednesday, and Friday, at 9.30, for four months. Professor GORE.

4. Algebra; Bowser's College Algebra. Tuesday, Thursday, and Saturday, at 4.50. Professor HODGKINS.

5. Plane Trigonometry; Crockett's Plane and Spherical Trigonometry. Monday, Wednesday, and Friday, at 9.30, for two months. Professor GORE.

6. Trigonometry; Crockett's Plane and Spherical Trigonometry. Monday, Wednesday, and Friday, at 5.40, for four months. Professor HODGKINS.

7. Spherical Trigonometry. Crockett's Plane and Spherical Trigonometry. Monday, Wednesday, and Friday, at 11.30, for two months. Professor GORE.

8. Analytic Geometry; Bowser's Analytic Geometry. Monday, Wednesday, and Friday, at 5.40, second term. Professor HODGKINS.

9. Analytic Geometry; Nichol's Analytic Geometry. Monday, Wednesday, and Friday, at 11.30, for four months. Professor GORE.

10. Theory of Equations; Barton's Theory of Equations. Monday, Wednesday, and Friday, at 11.30, for two months. Professor GORE.

NOTE.—Courses 2 and 4 are intended for students who desire to review some parts of elementary algebra and plane geometry, in order to obtain that thorough and ready knowledge of these fundamental mathematical studies that is necessary for their proper use in other subjects. These classes are not intended for beginners, and only students who have studied elementary algebra and plane geometry will be admitted.

Courses 1, 3, and 5 are designed to occupy one year; likewise Courses 2 and 4.

Engineering students whose time will permit are advised to complete during their first year Courses 1, 3, 5, 6, and 8.

*Second Section. For Undergraduates and Graduates.*

21. Differential and Integral Calculus; Taylor. Monday, Wednesday, and Friday, at 4.50, for six months. Professor GORE.

23. Differential Equations; Osborne. Monday, Wednesday, and Friday, at 4.50, for two months. Professor GORE.

25. Differential Equations. Johnson's Differential Equations. Two hours. Professor GORE.

In all of the above courses the text is supplemented by lec-

tures and the principles emphasized by proposing for solution a large number of problems taken from the best European and American authorities.

While the disciplinary value of the study of mathematics is never lost sight of, the importance of its practical application is insisted upon.

*Third Section. Primarily for Graduates.*

41. Theory of the Complex Variable. Lectures with reference to Durege and Forsyth. Three hours for four months. Professor GORE.

43. Functions. Lectures with reference to Harkness and Morley, Briot and Legendre. Three hours for four months. Professor GORE.

44. Functions arising from the solution of differential equations. Two hours. Asst. Professor RADELFINGER.

## MECHANICAL ENGINEERING.

FRANK VAN VLECK, M. E., Acting Professor of Mechanical Engineering.

EDWARD ADAMS MUIR, B. S., Assistant Professor of Graphics.

PHILANDER BETTS, E. E., Instructor in Electrical Engineering.

LOUIS E. GILES, B. S., Instructor in Mechanical Engineering.

*First Section. Primarily for Undergraduates.*

1. Machine Design. Proportioning of the following machine parts: Fastenings, toothed and belt gearing, rotating and sliding pieces, bearings, and connecting rods. Two two-hour periods. Thursday and Saturday, at 4.50. Professor MUIR.

2. Kinematics. Nature of mechanisms. Diagrams of the changes of position and speed in mechanisms. Tuesday, at 4.50; Friday, at 5.40. Mr. GILES.

3. Boilers. Location, construction, strength, and wear and tear of boilers. Monday and Wednesday, at 4.50, second term. Mr. BETTS.

*Second Section. For Undergraduates and Graduates.*

20. Thermodynamics. The steam-engine and other heat engines. Monday and Wednesday, at 5.40. Professor VAN VLECK.

21. Mechanical Technology. Shop visits. Examination of processes and appliances pertaining to pattern-making, molding, casting, forging, and finishing. Two two-hour periods. Mr. BETTS.

22. The Mechanical Engineering of Power Plants. Tuesday and Thursday, at 5.40. Mr. BETTS.

23. Engine Design. Theory of and calculations for a high-speed steam-engine. Four hours. Professor VAN VLECK.

24. Mechanics of the Machinery of Transmission. Four hours.

25. Measurement of Power. Practical work in indicating steam-engines, determining the evaporative efficiency of boilers, &c. Three periods. Mr. BETTS.

*Third Section. Primarily for Graduates.*

40. Advanced Steam-engine Design. Study of proportions of multi-expansion engines, with analysis of valves and link movements by Zeuner and other diagrams. Compilation of dimensions and attained results by reference to examples of best and recent practice.

41. Explosion Motors. The chemical and physical theory of, with examination into the essentials of the mechanical design, to be followed with a developed series of tests on the large Westinghouse gas engine, with which the mechanical-electrical laboratory of the University is provided.

42. Hydraulic Machinery. Pumps and pumping engines and the "duty" of pumping machinery and plants. Hydraulic-power applications and hydraulic-power transmission.

43. Hydraulic Prime Movers. Use of water under high heads or in large quantities. Study of modern turbines and high-speed wheels. With a library course, examining into the technical features of large hydraulic-power plants in this country or abroad, for this purpose using the files of the Congressional Library.

44. Compressed-air Machinery. Design of, with consideration of the mechanical and pneumatic principles. Transmission of air, with application in the arts.

45. Marine Machinery. Screw propulsion, design and proportioning of screws for assumed conditions of speed, displacement and horse-power, with examinations into the requirements of engine design for merchant and naval vessels. Special

needs of machinery and boilers on board ship, as the use of condensers, evaporators, distillers, etc., with study of the reasons for the design of the various types.

46. Ordnance Engineering. The metallurgy of gun steels. The practice of heavy forging. Machine "fits" and shrinkage. Ballistics and gun pressures; gun designs. Rapid-fire and automatic gun actions. Armor and projectiles.

47. Mechanical Refrigeration. Thermic principles involved in production of cold by expansion. Advantages possessed by use of ammonia, air, and other gases or fluids. Types of machines for these purposes in use.

48. A thesis on a subject to be selected by the student and which must involve original work, indicating that the writer has some power for original design or investigation. The approval of the subject must be given by the Professor of Mechanical Engineering.

## METEOROLOGY.

CLEVELAND ABBE, A. M., LL. D., Professor of Meteorology.

### *First Section. Primarily for Undergraduates.*

1. Observational Meteorology. The student will keep a personal diary of the meteorological conditions. The lectures will relate to instruments and methods of observing, computing, and graphic presentation of results. Tuesday and Thursday, at 5.40.

### *Second Section. For Undergraduates and Graduates.*

20. General Climatology. The lectures will cover all the elements of climate and some of the physical processes explaining the phenomena, the theory of probabilities so far as it is applied to climatology, and the determination of the coefficients or other factors that represent climatological peculiarities. Tuesdays and Thursdays, at 4.50.

### *Third Section. Primarily for Graduates.*

40. Experimental and Laboratory Work in Meteorology. The lectures will treat of the theories of instruments and the laws of meteorological phenomena, so far as they are susceptible of laboratory experiment.

41. Practical Meteorology. The lectures will treat of cartography, daily weather charts, methods of predicting the weather for a few days, long-range predictions for seasons, methods of verification, and the climates of past geological ages.

42. Physical and Theoretical Meteorology. The lectures will sketch the present state of our knowledge of atmospheric phenomena as a problem in thermodynamics and hydrodynamics. An extensive course of reading and private study will be marked out for the pupil, and his thesis for the degree of Ph. D. must be in the field of physical meteorology.

#### PHILOSOPHY.

JAMES MACBRIDE STERRETT, A. M., D. D., Head Professor of Philosophy.

WILLIAM T. HARRIS, LL. D., Lecturer on Philosophy.

WM. M. COLEMAN, A. M., Instructor in Philosophy.

##### *First Section. Primarily for Undergraduates.*

1a. Psychology. The aim is to make this work a preparation for an intelligent study of Ethics and Philosophy. A careful study is made of the phenomena of intellect, feeling, and will as organic processes of the man developing into conscious universal relations. A text-book is used, with lectures, themes, and constant reference to the leading works on Psychology. Monday, Wednesday, and Friday, at 9.30, for three months.

1b. Logic. Creighton's or Jevons' Logic is used as a text-book. Monday, Wednesday, and Friday, at 9.30, for two months.

1c. History of Philosophy. Outlines of the History of Philosophy. Text-books: Schwegler and Rogers. Monday, Wednesday, and Friday, at 9.30, for three months. Mr. COLEMAN.

##### *Second Section. For Undergraduates and Graduates.*

20. Historical Ethics. A study of the chief ethical theories; the members of the class are required to study the text of Aristotle, Kant, Mill, and Spencer, and to hand in well-prepared abstracts of their systems. The class-room work is devoted to a critical exposition of these and other theories by means of

lectures and discussions. Wednesday and Friday, at 10.30. First term. Professor STERRETT.

21. Theory of Ethics. A critical and constructive theory of Ethics, including a course of lectures on the fundamental postulates, concepts, and principles of Christian Ethics. Wednesday and Friday, at 10.30. Second term. Professor STERRETT.

22. History of Greek Philosophy. Special study of Plato and Aristotle. Knowledge of Greek is desirable for one taking this course. Lectures, prescribed readings, and theses. Tuesday and Thursday, at 10.30. Professor STERRETT.

23. History of Modern Philosophy. Lectures, prescribed readings, and theses. A reading knowledge of French and German is desirable. Tuesday and Thursday, at 10.30. Mr. COLEMAN.

24. History of Religions. Historical study of the great Religions of the World. Preparatory to course 45. Text-book, prescribed readings and theses. Two hours, first term. Professor STERRETT.

*Third Section. Primarily for Graduates.*

40. The Philosophy of Nature. A critical study of the fundamental concepts of Modern Physical Science. Prescribed readings, reports, and theses; Pearson's Grammar of Science; Stallo's Concepts and Theories of Modern Physics; Ward's Naturalism and Agnosticism; Holman's Matter, Energy, Force, and Work. Two hours, first term. Given in 1903-04 and in 1905-06. Professor STERRETT.

41. Introduction to Philosophy. A preliminary survey of the field, problems and methods of philosophy. Janet and Séailles' History of the Problems of Philosophy. Not given in 1904-05. Two hours, first term. Professor STERRETT.

42. The Critical Philosophy of Kant. This course will presuppose a knowledge of the History of Philosophy. Some knowledge of German is essential. The work will be devoted chiefly to the study of Kant's Critique of the Pure Reason. Two hours, second term. Mr. COLEMAN.

43. Hegel's System. Open to those who have taken Courses 23 and 42. Knowledge of German required. The work will be chiefly upon Hegel's Logik. Two hours, second term. Professor STERRETT.

44. The Philosophy of Religion. Open to those who have taken Courses 42 and 43 and 24. Caird's Introduction to the

Philosophy of Religion; Sterrett's Studies in Hegel's Philosophy of Religion. Two hours, second term. Professor STERRETT.

45. Ten lectures on the Philosophy of History, supplemented by a syllabus of prescribed readings, with theses and examination. Open to students who have taken at least Courses 22 and 23 in Philosophy and some courses in History. Two hours, second term. Dr. HARRIS.

46. Metaphysics. The fundamental problems of Philosophy. Materialism, Idealism, Pantheism, Theism, Cosmology and Anthropology.

Royce's *The World and the Individual*. Paulsen's *Introduction to Philosophy*. Marvin's *Introduction to Systematic Philosophy*. Advanced Course. Two hours, second term. Professor STERRETT.

47. The Society of Philosophical Inquiry, of which the Head Professor of Philosophy is president, meets every Tuesday during the year. Work can be arranged in this connection to count as a two-hour course for the year.

### PHYSICS.

HOWARD L. HODGKINS, Ph. D., Head Professor of Physics.

\*OSCAR QUICK, A. M., Instructor in Physics.

AREA B. MARVIN, A. B., Instructor in Physics.

#### *First Section. Primarily for Undergraduates.*

1. General Physics. A recitation and lecture course, embracing the fundamental principles of mechanics, sound, heat, light, and electricity. The lectures are illustrated by experiments. Plane trigonometry is used in the course, and only students who have completed or are studying a college course in trigonometry will be admitted. Monday, Wednesday, and Friday, at 4.50. Professor HODGKINS.

2. Laboratory Physics. A selected series of experiments, mainly quantitative. This course is designed to familiarize the student with the ordinary methods of exact experimentation, and to extend the knowledge of the principles of physics as gained in Course 1. This course is taken by Bachelor of Arts students who elect Course 1. Two two-hour periods. Tues-

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\* Resigned February 1, 1904.

day and Thursday, at 10.30. Professor HODGKINS, Mr. QUICK, and Mr. MARVIN.

3. Laboratory Physics. Similar to Course 2, and required of all Bachelor of Science students. Two two-hour periods. Tuesday and Thursday, at 10.30. Professor HODGKINS, Mr. QUICK, and Mr. MARVIN.

*Second Section. For Undergraduates and Graduates.*

20. Sound. A lecture and laboratory course. Three periods. Monday, Wednesday, and Friday, at 10.30. Professor HODGKINS.

21. Heat. A lecture and laboratory course, based on Preston's Theory of Heat and Maxwell's Theory of Heat. Three periods. Monday, Wednesday, and Friday, at 11.30. Professor HODGKINS.

22. Light. A lecture and laboratory course, based on Preston's Theory of Light. Three periods. Monday, Wednesday, and Friday, at 2.30. Professor HODGKINS.

*Third Section. Primarily for Graduates.*

40. Light. Advanced study, experimental and mathematical, of some one branch of the subject. Three periods. Professor HODGKINS.

Students who desire to specialize in physics should take Courses 1 and 2 or 3 in the first year, and should also study mathematics. In the second year one of the courses, 20, 21, or 22, may be taken; in the third year the two remaining courses may be taken. In order to do this, calculus should be studied during the second year.

The physical Laboratory is open from 9.30 a. m. to 10 p. m., giving students opportunity to do extra work.

## ROMANCE LANGUAGES.

GEORGE N. HENNING, A. M., Head Professor of Romance Languages.

WILLIAM W. SNIFFIN, Assistant in French.

### FRENCH.

*First Section. Primarily for Undergraduates.*

1. Grammar, composition, drill in pronunciation. Fraser and Squair's French Grammar. Translation and reading of

nineteenth century fiction and history. (400-500 pages.) For beginners. Monday, Wednesday, and Friday, at 10.30. Professor HENNING.

2. Identical with Course 1. Tuesday, Thursday, and Saturday, at 5.40. Professor HENNING and Mr. SNIFFIN.

3. Grammar, composition, conversation. Fraser and Squair's French Grammar. Translation and reading. Daudet, *Trois Contes*; A. Dumas, fils, *la Question d'argent*; Mérimée, *Colomba*; A. France, *Sylvestre Bonnard*; Molière, *l'Avaré*; Sarcy, *le Siège de Paris*; Coppée, *le Pater*; Zeller, *Richelieu*. (About 1,000 pages.) Open to students who have passed in Course 1 or 2, or have fulfilled the admission requirements in Elementary French. Monday, Wednesday, and Friday, at 3.30. Professor HENNING.

4. Identical with Course 3. Tuesday, Thursday, and Saturday, at 4.50. Professor HENNING and Mr. SNIFFIN.

6. General survey of French literature, seventeenth to nineteenth centuries; Warren's French Prose of the Seventeenth Century, Canfield's French Lyrics, Lacombe's *Petite Histoire du peuple français*, Crane's *la Société française au XVII<sup>e</sup> siècle*, Corneille, Molière, La Fontaine, Racine, St. Simon, Montesquieu, Marivaux, Voltaire, Buffon, Rousseau, Beaumarchais, Hugo, Musset, Michelet, Balzac, Augier, Maupassant, Pailleuron. (About 1,600 pages.) Translation, analyses of works read, collateral reading and reports thereon, lectures on literature, philology and history. Composition. Grandgent's Selections for French Composition. Open to students who have passed in Course 4, or have fulfilled the admission requirements in Advanced French. Monday, Wednesday, and Friday, at 2.30. Professor HENNING.

*Second Section. For Undergraduates and Graduates.*

21. Seventeenth century literature; history, philosophy, criticism, memoirs, letters, eloquence, drama, fiction. Descartes, Pascal, La Rochefoucauld, La Bruyère, Boileau, St. Simon, Mme. de Sévigné, Bossuet, Corneille, Racine, Molière, Mme. de La Fayette, etc. Translation, collateral reading and reports thereon, lectures on literature and history. Thesis. Open to students who have passed in Course 6. Given in 1904-'05. Not given in 1905-'06. Tuesday and Thursday, at 9.30. Professor HENNING.

23. Eighteenth century literature; history, philosophy, criticism, letters, drama, fiction, poetry. Montesquieu, Diderot,

Rousseau, Voltaire, Marivaux, Destouches, Beaumarchais, Bernardin de St. Pierre, André Chénier, etc. Translation, collateral reading and reports thereon, lectures on literature and history. Thesis. Open to students who have passed in Course 6. Not given in 1904-'05. Given in 1905-'06.

25. Nineteenth century literature ; history, philosophy, criticism, memoirs, travels, fiction, drama, lyric poetry. Thierry, Michelet, Mignet, Thiers, Taine, Sainte-Beuve, Brunetière, France, Lemaitre, Renan, Gautier, Mme de Staël, Chateaubriand, Dumas père, Hugo, George Sand, Mérimée, Balzac, Flaubert, Daudet, Maupassant, Loti, de Musset, Dumas fils, Augier, Maeterlinck, Rostand, Lamartine, de Vigny, the Romantic poets, the Parnassians, the Symbolists, etc. Translation, collateral reading and reports thereon, lectures on literature and history. Thesis. Open to students who have passed in French 6: Monday, Wednesday, and Friday, at 11.30. Professor HENNING.

*Third Section. Primarily for Graduates.*

43. Old French and philology. Darmesteter's Historical French Grammar. La Chanson de Roland, etc. One hour. Professor HENNING.

47. The comedies of Molière. One hour. Professor HENNING.

SPANISH.

*First Section. Primarily for Undergraduates.*

1. Grammar, composition. Edgren's Elementary Spanish Grammar. Ford's Spanish Composition. Translation and reading of nineteenth century fiction and drama. (500-600 pages.) Not open to first-year students. Open only to students who have had at least one year of French or Latin. Students may not elect Spanish and Italian in the same year. Monday, Wednesday, and Friday, at 1.30. Professor HENNING.

*Second Section. For Undergraduates and Graduates.*

20. Translation and reading of nineteenth and seventeenth century works ; history, fiction, drama, lyric poetry. (About 1,000 pages.) Lectures on literature and history. Open to students who have passed in Course 1 with at least the grade of C. Not given in 1904-'05. Given in 1905-'06.

ITALIAN.

*First Section. Primarily for Undergraduates.*

1. Grammar, composition. Grandgent's Italian Grammar. Grandgent's Italian Composition. Translation and reading of nineteenth century fiction and drama. (500-600 pages.) Not open to first-year students. Open only to students who have had at least one year of French or Latin. Students may not elect Spanish and Italian in the same year. Given in 1904-05. Not given in 1905-06. Tuesday and Thursday, at 10.30. Professor HENNING.

ZOÖLOGY.

THRODORE NICHOLAS GILL, M. D., Ph. D., LL. D.,  
Professor of Zoölogy.

PAUL BARTSCH, M. S., Professor of Zoölogy.

*First Section. Primarily for Undergraduates.*

1. Elementary Zoölogy. This includes lectures and laboratory work. The lectures in their scope cover all the branches of the animal kingdom, from the unicellular organisms to mammals, and correlated with these lectures is the study and dissection of type specimens in each group. This course is intended to familiarize the student with biological characters, classificatory laws, and the general principles of evolution.

Lecture, one hour; laboratory, one two-hour period.  
Monday and Friday, at 5.40. Professor BARTSCH.

*Second Section. For Undergraduates and Graduates.*

20. Advanced Zoölogy. Continuation of the work mapped out in Course 1, special attention being given to comparative morphology and histology of animal tissues.

Lecture, one hour; laboratory, one two-hour period.  
Monday and Friday, at 4.50. Professor BARTSCH.

21. Ornithology. In this course special attention is directed to the study of the birds of the District of Columbia. Frequent field excursions are made to familiarize the student with the haunts and habits of these forms.

Lecture, one hour; laboratory, one two-hour period.  
Tuesday and Thursday, at 4.50. Professor BARTSCH.

Special courses for teachers in the public schools and others desiring to take up special or advanced lines of work may be arranged upon consultation with the professor.

The collections of the United States National Museum and the Smithsonian Institution are consulted in connection with all these courses.

*Third Section. Primarily for Graduates.*

40. A general course of lectures on the principles of zoölogy, including a consideration of the philosophy, the methods of investigation, and the systems of zoölogy as determined by comparative anatomy. The lectures are supplemented by work in the laboratory, embracing histology, microtomy, and dissection. Professor GILL.

COURSES IN MEDICINE AND LAW.

Certain courses in the Departments of Medicine, Law, Jurisprudence and Diplomacy are open to students in the Department of Arts and Sciences. In general the courses may be taken during the last year of undergraduate work and during the years of graduate work, but the number of courses in these departments to be taken by any student will be limited, and the courses must be properly related to his principal subjects of study for his degree.

Such courses may be elected from the following subjects in the Department of Medicine :

Anatomy,  
Neurology,  
Bacteriology,  
Bio-Chemistry and Physiologic Chemistry,  
Histology,  
Hygiene,  
Pathology,  
Physiology.

Descriptions of the courses in these subjects are to be found in the announcements of the Department of Medicine.

Such courses may be elected, also, from the following subjects in the Departments of Law, and of Jurisprudence and Diplomacy :

History of the Common Law,  
Ancient and Roman Law,  
Mediaeval and Modern Civil Law,

Constitutional Law,  
International Law,  
European Diplomacy and Treaties,  
Diplomacy and Treaties of the United States,  
Statistics and Social Economics,  
Comparative Politics.

Descriptions of the courses in these subjects are to be found in the announcements of the Departments of Law, and of Jurisprudence and Diplomacy.

## REQUIREMENTS FOR DEGREES.

### UNDERGRADUATE DEGREES.

The undergraduate degrees offered by the University are Bachelor of Arts and Bachelor of Science. To be recommended for either of these degrees, the student must be registered in the Department of Arts and Sciences for at least one academic year, he must satisfy the admission requirements, and must complete at least sixty hours of undergraduate courses with the requisite grades.

The undergraduate courses leading to the degrees of Bachelor of Arts and Bachelor of Science are arranged especially with the design of giving a systematic discipline in liberal studies or the appropriate foundation for the specialized work in the various graduate and professional departments in the University.

To this end the disciplinary methods customary in college teaching are followed in the work of the first two years, or in the completion of two-thirds of the undergraduate requirements, which is designated as the "General Culture" course, while in the third year, or in the pursuit of the last third of the requirements, there is a transition to the university methods pursued in graduate schools.

In fulfillment of this idea, the "group" arrangement of studies has been in general adopted, being the mean between a fixed curriculum and the elective system, as it permits a reasonable liberty of choice, and at the same time preserves the correlation of studies best adapted for giving liberal culture and for gradually leading the student toward the career of specialized study he wishes to pursue.

The courses designed primarily for first and second year students are those numbered from 1 to 19. The courses de-

signed primarily for third-year students are those numbered from 20 to 39.

Students may elect as a part of the work of the third year the first year's work in the Department of Medicine or of Law. For such professional courses students may receive credit for as many units, or hours, of work, not exceeding ten, as would be granted for the same time in courses under University Subjects.

#### COURSES OF STUDY LEADING TO THE DEGREE OF BACHELOR OF ARTS.

To be recommended for the degree of Bachelor of Arts, the student must complete courses of study aggregating at least sixty units. The unit of credit is one hour of recitation or lecture work per week for one academic year. Laboratory hours count one-half unit each. Forty of these units are prescribed studies and twenty are electives. The elective studies may be evenly distributed between Group Electives and Free Electives, as indicated in the following plan:

I. Prescribed Studies	40 units
II. Group Electives	10 units
III. Electives	10 units

The Prescribed Studies, embraced within the first two years of the curriculum, are arranged in four "groups," each comprising (1) studies required of all Bachelor of Arts undergraduates; (2) studies especially emphasized in each group. The Group Electives consist of optional courses embracing cognate studies, chosen in the third year.

The courses of study and the schedule are so arranged that all the requirements for the Bachelor of Arts degree may be completed in three years by the attainment of twenty units each year, but in cases where it is necessary or expedient a longer period will be granted for the completion of the course.

The courses of study leading to the degree of Bachelor of Arts are as follows:

#### GROUP I.

##### *Classical Course.*

This is essentially the old College course, with due emphasis on the experimental and social sciences. Stress is laid upon Latin and Greek, each of which is studied two years. This

group lays the foundation for graduate courses in philology and literature.

<i>First Year.</i>		<i>Second Year.</i>	
	Units.		Units
English . . . .	3	English . . . .	3
Latin . . . .	4	Latin . . . .	3
Mathematics . . . .	3	Greek . . . .	3
Greek . . . .	4	German or French . . . .	3
French or German . . . .	3	Physics or Chemistry . . . .	5
History . . . .	3	Philosophy . . . .	3

*Third Year.*

- A. Ten hours, preferably from Group Elective 1. (See page 71.)
- B. Ten hours of third-year electives.

GROUP II.

*Modern Language Course.*

This group is designed for students who wish a literary training based upon the modern rather than upon the ancient languages. It differs from Group I in that it omits Greek, devotes more time to English, and emphasizes the study of French and German as factors in a liberal education. If the student has attained proficiency in French he may, in the second year, substitute Spanish or Italian for French. This group lays the foundation for graduate courses in philology and literature.

<i>First Year.</i>		<i>Second Year.</i>	
	Units.		Units
English . . . .	4	English . . . .	3
Latin . . . .	4	Latin . . . .	3
Mathematics . . . .	3	Romance Languages . . . .	3
French . . . .	3	German . . . .	3
German . . . .	3	Physics or Chemistry . . . .	5
History . . . .	3	Philosophy . . . .	3

*Third Year.*

- A. Ten hours, preferably from Group Elective 1. (See page 71.)
- B. Ten hours of third-year electives.

## GROUP III.

*Historical-Political Course.*

This group is designed to give liberal culture, chiefly through attention to the social sciences. It affords a basis for the subsequent study of history, the political and social sciences, or for the profession of law.

<i>First Year.</i>		<i>Second Year.</i>	
	Units.		Units.
English . . . . .	3	English . . . . .	3
Latin . . . . .	4	French or German . . . . .	3
Mathematics . . . . .	3	Physics or Chemistry . . . . .	5
French . . . . .	3	History . . . . .	4
German . . . . .	3	Politics and Economics . . . . .	2
History . . . . .	2	Philosophy . . . . .	3
Politics and Economics . . . . .	2		

*Third Year.*

- A. Ten hours, preferably from Group Elective 2. (See page 71.)  
 B. Ten hours of third-year electives.

## GROUP IV.

*Mathematical-Physical Course.*

The chief feature of this group is the predominance given to mathematics and the experimental sciences as elements of general culture. It provides for two years each of mathematics, physics, and chemistry, and differs from the Bachelor of Science groups in that it prescribes two years of English and one year of Latin. The group affords a satisfactory basis for the subsequent study of the mathematical and physical sciences and for the profession of medicine; and it will appeal especially to scientific students who desire to combine the pursuit of the humanities with that of the sciences.

<i>First Year.</i>		<i>Second Year.</i>	
	Units.		Units.
English . . . . .	3	English . . . . .	3
Latin . . . . .	4	Mathematics . . . . .	3
Mathematics . . . . .	3	French or German . . . . .	3
French or German . . . . .	3	Physics and Chemistry . . . . .	7
Physics or Chemistry . . . . .	5	Philosophy . . . . .	3
History . . . . .	2	Politics . . . . .	1

*Third Year.*

- A. Ten hours, preferably from Group Elective 3 or 4.
- B. Ten hours of third-year electives.

*Group Electives.*

- 1. Languages—Greek, Latin, Romance, German, English.
- 2. Philosophy, History, Politics, Economics.
- 3. Mathematics, Physics, Chemistry, Astronomy.
- 4. Physics, Chemistry, Geology, Botany, Zoölogy.

COURSES OF STUDY LEADING TO THE DEGREE OF  
BACHELOR OF SCIENCE.

To be recommended for the degree of Bachelor of Science, the student must complete courses of study aggregating at least sixty units. The unit of credit is one hour of recitation or lecture work per week for one academic year. Laboratory hours count one-half unit each. Forty of these units must be selected from courses announced as suitable for first and second year students, and must include the topics named below, and twenty of the units must be selected from courses announced as suitable for third-year students.

Since there are certain options and electives in the studies that may be offered in satisfaction of the admission requirements, there will be corresponding variations in the courses that must be taken by students; but in every case the following subjects must be completed :

Courses.	
English . . . . .	1 or 2 and 4
Mathematics . . . . .	1, 3, 5, 7, 9, 10, or 2, 4, 6, 8
French . . . . .	1, 3, or 2, 4
German . . . . .	1, 3, or 2, 4
Chemistry . . . . .	1 and 2 or 3
Physics . . . . .	1, 3
Electives :	

List 1. History, Economics, Philosophy.

One two-hour course.

List 2. Astronomy, Botany, Geology,  
Mineralogy, Meteorology, Zoölogy.

Two two-hour courses.

If any of these topics be presented and accepted in satisfaction of the admission requirements, additional topics must be

taken, so that the total work for the degree shall aggregate sixty units, divided, as mentioned above, between the topics open to first and second year students and those open to third-year students.

The courses of study and the schedule are so arranged that all the requirements for the degree may be completed in three years by the attainment of twenty units each year; but in cases where it is expedient or necessary a longer period will be granted for the completion of the course.

If a student elect studies largely in one line of work, a diploma may be issued stating the course for which the degree is given.

The courses of study leading to the degree of Bachelor of Science are as follows:

#### GROUP I.

##### *General Course.*

The studies in this group are required of all candidates for the degree of Bachelor of Science, and are included in each of the succeeding groups. The order of topics will vary somewhat according to the topics offered for admission and according to the subjects that the student plans to elect. In general, the subjects may be distributed as follows:

<i>First Year.</i>		<i>Second Year.</i>	
	Units.		Units.
English . . . . .	3	Mathematics . . . . .	3
Mathematics . . . . .	3	French or German . . . . .	3
French . . . . .	3	Electives, List 1 or List 2	
German . . . . .	3	(see page 71) . . . . .	4
Physics or Chemistry . . . . .	5	Chemistry or Physics . . . . .	5
Electives, List 1 or List 2		Electives . . . . .	6
(see page 71) . . . . .	2		

##### *Third Year.*

Twenty hours of third-year electives.

#### GROUP II.

##### *Civil Engineering.*

On the completion of this group the student may be given the degree of Bachelor of Science in Civil Engineering. The

completion of this group admits the student to the course leading to the degree of Civil Engineer.

*First Year.*

	Units
Mathematics . . . . .	6
English . . . . .	3
French or German . . . . .	3
Freehand Drawing . . . . .	1
Mechanical Drawing . . . . .	2
Descriptive Geometry . . . . .	2
Surveying . . . . .	2
Materials of Construction . . . . .	2

*Second Year.*

	Units
Calculus . . . . .	3
Mechanics . . . . .	3
Hydraulics . . . . .	1
Railroad Engineering . . . . .	2
Sanitary Engineering . . . . .	2
Graphic Statics . . . . .	2
Chemistry or Physics . . . . .	5
French or German . . . . .	3

*Third Year.*

	Units
Hydraulic Engineering . . . . .	1
Masonry . . . . .	1
Structures . . . . .	3
Strength of Materials . . . . .	2
Metallurgy . . . . .	1
German or French . . . . .	3
Physics or Chemistry . . . . .	5
Electives, List 1 and List 2 (see page 71) . . . . .	6

GROUP 1.1.

*Electrical Engineering.*

On the completion of this group the student may be given the degree of Bachelor of Science in Electrical Engineering. The completion of this group admits the student to the course leading to the degree of Electrical Engineer.

*First Year.*

	Units
Mathematics . . . . .	6
English . . . . .	3
French or German . . . . .	3
Freehand Drawing . . . . .	1
Mechanical Drawing . . . . .	2
Descriptive Geometry . . . . .	2
Physics . . . . .	5

*Second Year.*

	Units
Calculus . . . . .	3
French . . . . .	3
German . . . . .	3
Machine Drawing . . . . .	2
Kinematics . . . . .	2
Chemistry . . . . .	5
Electricity, Lectures and Laboratory . . . . .	6

*Third Year.*

	Units.
Mechanics . . . . .	3
Hydraulics . . . . .	1
Metallurgy . . . . .	1
Machine Design . . . . .	2
Power Plants . . . . .	2
Strength of Materials . . . . .	2
Electricity, Lectures and Laboratory . . . . .	8
Electives, List 1 and List 2 (see page 71) . . . . .	6

## GROUP IV.

*Mechanical Engineering.*

On the completion of this group the student may be given the degree of Bachelor of Science in Mechanical Engineering. The completion of this group admits the student to the course leading to the degree of Mechanical Engineer.

*First Year.**Second Year.*

	Units.		Units.
Mathematics . . . . .	6	Calculus . . . . .	3
English . . . . .	3	French . . . . .	3
French or German . . . . .	3	German . . . . .	3
Freehand Drawing . . . . .	1	Machine Drawing . . . . .	2
Mechanical Drawing . . . . .	2	Kinematics . . . . .	2
Descriptive Geometry . . . . .	2	Chemistry . . . . .	5
Physics . . . . .	5	Mechanical Engineering . . . . .	3
		Electives, List 1 (see page 71) . . . . .	2

*Third Year.*

	Units.
Mechanics . . . . .	3
Metallurgy . . . . .	1
Electives, List 2 (see page 71) . . . . .	4
Machine Design . . . . .	2
Mechanical Engineering . . . . .	15

## GROUP V.

*Chemistry.*

On the completion of this group the student may be given the degree of Bachelor of Science in Chemistry.

*First Year.*

	Units.
Mathematics . . . . .	3
English . . . . .	3
Freehand Drawing . . . . .	1
Mechanical Drawing . . . . .	2
Machine Drawing . . . . .	2
French . . . . .	3
German . . . . .	3
Chemistry, Lectures and Laboratory . . . . .	5

*Second Year.*

	Units.
Mathematics . . . . .	3
French or German . . . . .	3
Physics . . . . .	5
Chemistry, Lectures and Laboratory . . . . .	9

*Third Year.*

	Units.
Electives, List 1 and List 2 (see page 71) . . . . .	6
Chemistry, Lectures and Laboratory . . . . .	14

GROUP VI.

*Architecture.*

On the completion of this group the student may be given the degree of Bachelor of Science in Architecture.

*Second Year.*

	Units.
Mathematics . . . . .	3
English . . . . .	3
French . . . . .	3
German . . . . .	3
Electives, List 2 . . . . .	2
Mechanical Drawing . . . . .	2
Descriptive Geometry . . . . .	2
Architecture . . . . .	4

*First Year.*

	Units.
Mathematics . . . . .	3
French or German . . . . .	3
Physics . . . . .	5
Chemistry . . . . .	5
Electives, List 1 (see page 71) . . . . .	2
Architecture . . . . .	8

*Third Year.*

	Units.
Calculus . . . . .	3
Strength of Materials . . . . .	2
Mechanics . . . . .	3
Metallurgy . . . . .	1
Electives, List 2 (see page 71) . . . . .	2
Graphic Statics . . . . .	2
Architecture . . . . .	12

## SCHEDULE

Hour.	Monday.	Tuesday.	Wednesday.
9.10	Chapel.	Chapel.	Chapel.
9.40	History, 25. Mathematics, 1, 3, 5. Philosophy, 1.	English, 1. French, 21. Greek, 20. Philosophy, 24.	Mathematics, 1, 3, 5. Philosophy, 1.
10.30	English, 3. French, 1. Physics, 20.	History, 1. Italian, 1. Latin, 20. Philosophy, 22, 23. Physics, 2, 3.	English, 3. French, 1. Philosophy, 20, 21. Physics, 20.
11.30	French, 25. German, 1. Greek, 3. Mathematics, 7, 9, 10. Physics, 21.	German, 20. History, 2. History, 3. Physics, 2, 3.	French, 25. German, 1. Greek, 3. Mathematics, 7, 9, 10. Physics, 21.
12.30	Recess.	Recess.	Recess.
1.10	English, 22. German, 6. Latin, 1. Spanish, 1.	Chemistry, 2, 3. English, 20. Greek, 22. Latin, 22.	English, 22. German, 6. Latin, 1. Spanish, 1.
2.30	French, 6. Greek, 1. Physics, 22.	Chemistry, 2, 3. English, 21. History, 23, 24.	French, 6. Greek, 1. Physics, 22. Political Science, 29.
3.30	French, 3. German, 3. Latin, 3.	German, 21. Greek, 2. History, 21.	French, 3. German, 3. History, 22. Latin, 3.
4.30	Botany, 20. Chemistry, 27. Civil Engineering, 1. Civil Engineering, 22. Electric'l Engin., 20, 21. English, 2. Geology, 20. Mathematics, 21, 23. Mechanical Engin., 3. Physics, 1. Zoology, 20.	App'd Mathematics, 20. Archæology, 22. Botany, 21. Chemistry, 1. Civil Engineering, 2. French, 4. German, 2. History, 20. Mathematics, 4. Mechanical Engin., 2. Meteorology, 20. Zoology, 21.	Botany, 20. Chemistry, 23. Civil Engineering, 3. Civil Engineering, 22. Electrical Engin., 20, 21. English, 4. Mathematics, 21, 23. Mechanical Engin., 3. Physics, 1.
5.40	Astronomy, 1. Botany, 1. Chemistry, 26. Civil Engineering, 1. Civil Engineering, 2. Electrical Engin., 1. English, 27. Geology, 2. Graphics, 1. Mathematics, 6, 8. Mechanical Engin., 20. Zoology, 1.	Chemistry, 6. French, 2. Geology, 1. German, 4. Graphics, 8. Mathematics, 2. Mechanical Engin., 22. Meteorology, 1. Political Science, 20.	Applied Mathematics, 22. Architecture, 1. Chemistry, 27. Civil Engineering, 4. Economics, 1. Electrical Engin., 1, 2. Electrical Engin., 22. English, 5. Graphics, 21. Mathematics, 6, 8. Mechanical Engin., 20.

FOR 1904-1905.

THURSDAY.	FRIDAY.	SATURDAY.	Hour
Chapel.	Chapel.		9.10.
English, 1. French, 21. Greek, 20. Philosophy, 24.	Mathematics, 1, 3, 5. Philosophy, .		9.30.
History, 1. Italian, 1. Latin, 30. Philosophy, 22, 23. Physics, 2, 3.	English, 3. French, 1. Philosophy, 20, 21. Physics, 20.		10.30.
German, 20. Greek, 21. History, 2. Physics, 2, 3.	French, 25. German, 1. Greek, 3. Mathematics, 7, 9, 10. Physics, 21.		11.30.
Recess.	Recess.		12.30.
Chemistry, 2, 3. Greek, 22. Latin, 23.	English, 22. German, 6. Latin, 1. Spanish, 1.		1.30.
Chemistry, 2, 3. English, 21. History, 23, 24.	French, 6. Greek, 1. Physics, 22. Political Science, 23.		2.30.
German, 21. History, 21. Latin, 2.	French, 3. German, 3. History, 22. Latin, 3.		3.30.
App'd Mathematics, 20. Archæology, 22. Botany, 21. Chemistry, 1. Electrical Engin., 2. French, 4. German, 2. Graphics, 20. History, 20. Mathematics, 4. Mechanical Engin., 1. Meteorology, 20. Zoology, 21.	Botany, 20. Chemistry, 23. Civil Engineering, 20. Civil Engineering, 22. Electrical Engin., 20, 21. English, 2. Geology, 20. Mathematics, 21, 23. Physics, 1. Zoology, 20.	Applied Mathematics, 20. Botany, 21. Chemistry, 1. Civil Engineering, 21. Electrical Engin., 2. French, 4. German, 2. Graphics, 20. Mathematics, 4. Mechanical Engin., 1.	4.50.
Astronomy, 1. Chemistry, 24. French, 2. Geology, 1. German, 4. Graphics, 8. Mathematics, 2. Mechanical Engin., 22. Meteorology, 1. Political Science, 21.	Applied Mathematics, 21. Botany, 1. Chemistry, 20. Civil Engineering, 4. Economics, 1. English, 27. Geology, 2. Graphics, 1. Graphics, 3. Mathematics, 6, 8. Mechanical Engin., 2. Zoology, 1.	Applied Mathematics, 22. Chemistry, 24. Civil Engineering, 1. Electrical Engin., 22. French, 2. German, 4. Graphics, 3. Graphics, 21.	5.40.

## UNDERGRADUATE AND PROFESSIONAL COURSES.

Students in the last year of their undergraduate course may take as part of their electives the first year's work in the Department of Medicine or of Law, and may receive credit for as many units of work, not exceeding ten, as would be granted for the same time in courses under University Subjects.

## SUBJECTS FOR STUDENTS HOLDING "POWELL SCHOLARSHIPS."

The subjects to be taken by a student will vary according to his preparation and according to the purpose for which he has been awarded the scholarship, but a year's work can be selected from the following topics :

	Hours.
Navigation and Nautical Astronomy . . . . .	6
Algebra and Geometry . . . . .	3
Trigonometry . . . . .	1½
Mechanical and Machine Drawing . . . . .	2
Meteorology . . . . .	2
English . . . . .	3
French . . . . .	3
German . . . . .	3
Spanish . . . . .	3
International Law . . . . .	1
Commercial Geography . . . . .	1
Admiralty Law . . . . .	½
Boilers . . . . .	1
Measurement of Power . . . . .	3
Dynamo, theory . . . . .	2
"    testing . . . . .	3

## HIGHER DEGREES.

## DEGREE OF MASTER OF ARTS.

Before a student can be admitted to candidature for the degree of Master of Arts he must give evidence that he has completed a liberal undergraduate course of academic study such as is required by colleges of good standing antecedent to the baccalaureate degree. The President's Council reserves the right to decide in all cases whether the antecedent training fulfils the requirements. Moreover, the courses of study pursued for this degree must be approved by the University Council as

qualifying the candidate for pursuing a chosen line of study for the Master's degree.

A candidate for this degree shall pass at least one full year of residence and study at this University, and shall sustain satisfactory examinations on the studies pursued and present an acceptable thesis, together with a bibliography.

Three full courses throughout the year shall be the minimum required as constituting a full year's work.

The courses chosen must be passed upon by the President's Council and have the approval of the professors under whom they are to be taken.

These courses may consist of special study or research work. In any case they must form a consistent plan of work, for which the candidate's previous work has qualified him.

No work done for a Bachelor's degree shall be counted again for a Master's degree.

Theses in their final form must be presented not later than May 1.

#### DEGREE OF MASTER OF SCIENCE.

Before a student can be admitted to candidature for the degree of Master of Science he must give evidence that he has completed a liberal undergraduate course of academic study such as is required by colleges of good standing antecedent to the baccalaureate degree. The President's Council reserves the right to decide in all cases whether the antecedent training fulfils the requirements. Moreover, the courses of study pursued for this degree must be approved by the University Council as qualifying the candidate for pursuing a chosen line of study for the Master's degree.

A candidate for this degree shall pass at least one full year of residence and study at this University, and shall sustain satisfactory examinations on the studies pursued and present an acceptable thesis, together with a bibliography.

Three full courses throughout the year shall be the minimum required as constituting a full year's work.

The courses chosen must be passed upon by the President's Council and have the approval of the professors under whom they are to be taken.

These courses may consist of special study or research work. In any case they must form a consistent plan of work, for which the candidate's previous work has qualified him.

No work done for Bachelor's degree shall be counted again for a Master's degree.

Theses in their final form must be presented not later than May 1.

## DEGREES IN ENGINEERING.

Before a student can be admitted to candidature for degrees in Engineering he must give evidence that he has completed a liberal undergraduate course of academic study such as is required by colleges of good standing antecedent to the baccalaureate degree. The President's Council reserves the right to decide in all cases whether the antecedent training fulfils the requirements. Moreover, the courses of study pursued for the Bachelor's degree must be approved by the University Council as qualifying the candidate for pursuing the chosen line of study for the degree.

A candidate for a degree in Engineering shall pass at least one full year of residence and study at this University, and shall sustain satisfactory examinations on the studies pursued and present an acceptable thesis, together with a bibliography.

Three full courses will be the minimum required as constituting a full year's work. At least one-half of this work must be in the course in which the degree is sought and the balance in correlated courses. The courses chosen must be passed upon by the President's Council and have the approval of the professors under whom they are to be taken.

Theses in their final form must be presented not later than May 1.

## DEGREE OF DOCTOR OF PHILOSOPHY.

GENERAL STATEMENT.—The degree of Doctor of Philosophy is conferred upon students who have pursued specialized courses in university subjects and engaged in original research in certain of the various departments of letters or science, under university auspices, for a period of not less than three years, and have submitted an acceptable thesis and met all the requirements prescribed. The degree is given, however, not because of the faithful completion of a course of study according to a stated program for a given length of time, but for high attainments and proved ability to do research work in some special branch of knowledge, as determined by the various tests applied.

ELIGIBILITY OF THE CANDIDATE.—Before a student can be admitted to candidature for the degree of Doctor of Philosophy he must give evidence that he has completed a liberal undergraduate course of academic study such as is required by colleges of good standing antecedent to the baccalaureate degree. The President's Council reserves the right to decide in all cases whether the antecedent training fulfils the requirements. The

applicant may be credited with graduate work done at other universities, provided that such work is shown to be of grade similar to that required here, but at least one year must be spent in residence at this University and the other requirements of the degree as prescribed here must be fulfilled.

**REQUIREMENTS FOR THE DEGREE.**—Candidates for the degree of Doctor of Philosophy shall offer themselves in three topics from the University Subjects—one major and two collateral minor studies—the combination to be approved by the President's Council. These must be pursued under the guidance of a sub-committee consisting of the professors in charge of the departments in which studies are pursued, with the professor in the major subject as chairman. This sub-committee, in charge of the candidate, shall determine his division of time, study, and research among the major and minor topics, but in general the major topic should be pursued during the whole time devoted to graduate work, and each minor topic during at least one year.

The candidate shall pass satisfactory written examinations upon the three subjects selected. The examinations in the minor topics may be taken at the completion of the courses pursued or at the discretion of the professor in charge. In written examinations the time limit is four hours for the major and three hours for the minor topics.

The candidate must show that he possesses a reading knowledge of French and German, as evinced by familiarity with philological or scientific monographs pertaining to his special branches of study. The head professor of a subject may require such knowledge of other subjects as is considered fundamental.

The candidate must present a satisfactory thesis, together with an exhaustive bibliography, exhibiting independent research in some branch of his major subject, under the following regulations:

**REGULATIONS REGARDING THESES.**—Theses must be presented not later than May 1 of the year in which the degree is sought. After their acceptance, theses, with their accompanying drawings, are the property of the University, and must be deposited in the University archives, but authors are permitted to make copies. All theses must be typewritten on official thesis paper, which may be obtained from the Assistant Treasurer of the University.

No thesis for the degree of Doctor of Philosophy shall be submitted to the University Council until it has been approved

by the professor having supervision of the major topic, and also by a co-referee to be appointed by the President's Council. The referees shall present to the Council written reports on the thesis to be filed therewith.

The candidate is expected to print his thesis, under the supervision of the professor in charge of his major topic, within one year after the degree is conferred, and shall present one hundred copies to the University, to be distributed among institutions of learning.

The candidate must defend his thesis and submit to an oral examination upon his major topic before a board of experts consisting of three specialists of university standing and established reputation in the subject represented by the principal topic, to be appointed by the President's Council.

#### UNDERGRADUATE PRIZES.

Only candidates for degrees may compete for these prizes.

**STAUGHTON AND ELTON PRIZES.**—The Staughton Prize, for excellence in the Latin Language and Literature, and the Elton Prize, for excellence in the Greek Language and Literature, founded by the Rev. Romeo Elton, D. D., of Exeter, England, consist of two gold medals, annually awarded to the best scholar in each of these languages.

**RUGGLES PRIZES.**—The Ruggles Prizes, for excellence in Mathematics, founded by Professor William Ruggles, LL. D., consist of two gold medals, annually awarded upon examination to the best two scholars in Mathematics.

**MUNROE PRIZE.**—Professor Munroe offers a gold medal to that student from any Washington High School or the Manual Training School who shall attain the highest mark in Chemistry among those passing the entrance examinations, and shall remain in regular attendance for one year.

**CLASS OF '96 JAMES MACBRIDE STERRETT, JR., MEMORIAL MEDAL.**—This prize is annually awarded to that student taking Course I in Physics who obtains the highest average in a special examination on a given subject and in the writing of an essay on an assigned topic.

**DAVIS PRIZES.**—The Davis Prizes, for excellence in Elocution, founded by the Hon. Isaac Davis, LL. D., of Massachusetts, consist of three gold medals, annually awarded to the successful competitors in a public contest. Members of the Senior Class are eligible to compete for these prizes.

DAUGHTERS OF THE AMERICAN REVOLUTION PRIZES.—These prizes, founded by the Daughters of the American Revolution of the District of Columbia, consist of two gold medals, awarded annually to the two students in the graduating class who, having maintained a high standing in the regular courses in History during three years, shall produce the best essays upon an assigned topic of American history.

THOMAS F. WALSH PRIZE IN IRISH HISTORY.—This prize is a gold medal, awarded to that student in the graduating class who, having maintained a high standard in the regular courses of History, shall produce the best essay based upon the study of some period of Irish history.

E. K. CUTTER PRIZE.—The E. K. Cutter Prize in English was founded by the late Marion Kendall Cutter. The endowment is a fund of one thousand dollars, the income of which is given annually as a prize "for excellence in the study of English." The prize will be awarded to that member of the graduating class whose record in English, combined with general excellence, shows most marked aptitude and attainment in English studies.

WILLIE E. FITCH PRIZE.—The Willie E. Fitch Prize, for highest excellence in all branches of Chemistry, founded by James E. Fitch, Esq., in memory of his son, consists of fifty dollars, which is awarded annually for the best examination in Chemistry.

SCHMIDT PRIZE.—Mr. Fred. A. Schmidt offers a prize to the student who attains the highest standing in Descriptive Geometry, Trigonometry, and Analytic Geometry.

MUTH PRIZE.—Geo. F. Muth & Co. offer a set of Drawing Instruments to the student taking Machine Drawing who makes the highest average record in that subject and in the previous year's Mechanical Drawing.

#### SCHOLARSHIPS.

Applications for scholarships should be filed with the Corresponding Secretary of the University not later than September fifteenth. All scholarships except the Kendall Scholarship and the University Scholarships are awarded for one year only, but they may be renewed. Students holding scholarships pay the matriculation, library, laboratory, and graduation fees.

**KENDALL SCHOLARSHIP.**—The Kendall Scholarship, founded by the late Hon. Amos Kendall, is annually conferred on that student from any of the Washington High Schools or from the Manual Training School who attains the highest average in the May entrance examinations. This scholarship continues throughout the undergraduate course.

**UNIVERSITY SCHOLARSHIPS.**—The University offers also six scholarships, each continuing throughout the undergraduate course, to be awarded annually to members of the graduating classes of the High Schools of Washington and of the Manual Training School. The scholarships will be divided among the several schools in proportion to the number of students in attendance upon each. Three scholarships are offered to young men and three to young women. No scholarship will be awarded to a candidate whose examination average is below 80 per cent. Candidates for these scholarships will take the May entrance examinations for the undergraduate course leading to the degree of Bachelor of Arts or the degree of Bachelor of Science, as they shall elect, and on the results of these examinations the scholarships will be assigned. Holders of these scholarships will be expected to pursue a regular course, classical or scientific, leading to a degree.

**DAVIS SCHOLARSHIP.**—This is the income of a fund of one thousand dollars given to the University in October, 1869, by Hon. Isaac Davis, of Massachusetts.

**MARY LOWELL STONE SCHOLARSHIP.**—This scholarship was founded by a woman in memory of a woman student of science. It consists of a fund of two thousand dollars, the income from which is to be paid to needy women students of science in the University; it will be awarded by the President's Council.

**HENRY HARDING CARTER SCHOLARSHIPS.**—These scholarships, founded by Mrs. Maria M. Carter in memory of her husband, Henry Harding Carter, consist of four scholarships of the annual value of fifty dollars each, and may be awarded to deserving students who are preparing for the civil engineering profession.

**MARIA M. CARTER SCHOLARSHIP.**—This is the income of a fund of one thousand dollars given to the University in 1871 by Mrs. Maria M. Carter.

**FARNHAM SCHOLARSHIP.**—This is the income of a fund of one thousand dollars given to the University in 1871 by Mrs. Robert Farnham.

**POWELL SCHOLARSHIPS.**—The Powell Scholarships were founded by the late Admiral Powell, U. S. Navy. The income from this endowment is for "the free education of such young men as may desire to take advantage of the said endowment by way of their preparation for entrance into the Naval Academy at Annapolis, Maryland, or such as may fit them to become mates or masters in the Merchant Marine Service of the United States," and of "such apprentices as, having filled their time in the great steam manufactory establishments of the country, may apply for appointment from civil life in the Steam Engineer Department of the United States Navy." The number of scholarships awarded each year will be determined by the income from the endowment. Each scholarship will entitle the beneficiary to free tuition for one year. Such special courses of study are offered to each student as will give him the instruction needed to accomplish the purpose for which he is awarded the scholarship. Desirable courses are designated on page 78 of this bulletin. All the courses of instruction are open to students of suitable age and attainments who wish, without reference to any degree, to pursue special studies.

#### FINAL EXAMINATIONS.

Examinations are conducted under the following rules of the Board of Trustees:

Examinations for degrees shall close at least three weeks before the end of the scholastic year, and the names of all candidates for degrees who have passed a successful examination shall be officially reported to the President at least two weeks before the date of the commencement.

No student shall be admitted to an examination for promotion from a lower to a higher class or to a final examination who is in arrears for tuition and whose name has not been certified by the Assistant Treasurer to the professors proposing to hold an examination. Professors and instructors will require students entering such examinations to present their cards of admission from the Assistant Treasurer before permitting them to be examined.

#### ANNUAL COMMENCEMENT.

The Annual Commencement is held on the Wednesday nearest the first of June.

All the degrees are publicly conferred on Commencement Day. Prizes for special excellence in any department are publicly delivered on the same day.

Candidates for degrees are expected to appear at the Commencement in academic caps and gowns.

#### PUBLIC WORSHIP.

Devotional exercises are held in the Hall of the University on every week day except Saturday, at 9.10 o'clock a. m. All students are invited to attend these services.

#### LIBRARY FACILITIES.

A well-equipped reference library and reading-room is open to students from 9.30 a. m. to 10 p. m. It contains encyclopædias, dictionaries, standard works in the various departments of study comprised under University Subjects, and the leading literary and scientific magazines and reviews.

The great Library of Congress—the largest in the country—is steadily perfecting its collections of standard works in the various branches of university study, and advanced and graduate students are there given every facility for pursuing their investigations. The Public Library of the District of Columbia is being rapidly equipped with books of especial importance to students, and its facilities are available under the most favorable conditions. Under certain restrictions, the libraries of the governmental departments may also be utilized. All these libraries are within easy reach of the University.

#### MECHANICAL AND ELECTRICAL ENGINEERING LABORATORY.

The Mechanical Engineering department is provided with a valuable collection of machine parts, illustrating the best modern practice, such as shaft-hangers, pedestals, valves, jacks, friction clutches, &c.

Arrangements are being made to provide the necessary additional testing machines and instruments to give a laboratory course in engineering practice. The lighting and heating plant now installed in University Hall forms an excellent basis for such work.

A 25 K. W. direct-current Westinghouse dynamo, directly connected to a Westinghouse gas engine of the latest type, has been installed. The dynamo was specially constructed to adapt it to experimental requirements, generating both direct and polyphase alternating currents. The surplus power of the

Westinghouse gas engine is utilized in driving smaller dynamos of various types for testing purposes.

The engine is one of the latest and most improved types of gas engines, being a two-cylinder single-acting engine, giving an explosion every revolution, and an exceptionally close regulation. Provision is made for testing the efficiency of each machine independently, or the combined unit under a great variety of conditions.

In addition to the above, an experimental electrolytic refining plant has been installed, current for which is furnished by a Crocker & Wheeler motor dynamo, giving 150 amperes at 6 volts. Special investigations in electro-metallurgy are in contemplation.

The laboratory is equipped with direct and alternating current generators and motors for experimental purposes, and with the necessary measuring apparatus, direct and alternating current ammeters and voltmeters, galvanometers, standard resistances, standard cells, etc.

#### DAVIS PRIZE SPEAKING.

The Davis Prize Speaking is held in University Hall on the Wednesday after the Easter holidays. The Davis Prizes were founded by Hon. Isaac Davis, of Massachusetts, in 1847. The original endowment was five hundred dollars, "proceeds of which will afford three premiums, in cash or gold medals, of the value of \$5, of \$10, and of \$15 annually—these premiums or prizes to be distributed annually to such members of the senior class as shall have made the greatest progress in elocution since their connection with the College."

The award of these three prizes is determined by a public speaking contest, in which the participants deliver original orations. Senior students wishing to enter the competition should report to the Head Professor of English not later than five weeks before the contest, and submit their orations not later than three weeks before the contest. The prizes are awarded by a committee consisting of three members, selected by the President's Council.

#### ENOSINIAN SOCIETY.

The Enosinian Society, a literary association formed by the students of the Department of Arts and Sciences, meets regularly for the purpose of improvement in Debate and Composition.

This Society had its beginning on March 6, 1822, during the

first session of Columbian College, when a number of students held a meeting "for the purpose of establishing a debating society." Two Enosinian prizes are given annually and are publicly delivered at the Commencement. They are the following:

DEBATERS' PRIZE.—A gold medal given by the Society for proficiency in debate.

GORE PRIZE IN PARLIAMENTARY LAW.—A gold medal given by Prof. James Howard Gore for proficiency in parliamentary law.

#### HONORABLE DISMISSION.

An honorable dismission will always be granted to any student in good standing who may desire to withdraw from the University.

#### FEES.

1. University matriculation fee (payable but once)	\$5
2. Annual library fee	2
3. One hour per week	15
4. Each additional hour up to and including eight	10
5. Ten hours per week	100
6. Eleven or twelve hours per week	110
7. Over twelve hours per week	125

#### NOTE.—

- (a) Tuition fees are based upon the number of hours per week throughout the academic year.
  - (b) The fee is determined by the number of hours taken at entrance.
  - (c) No changes will thereafter be made except at the end of the term.
  - (d) In determining fees two hours of laboratory work count as one hour.
  - (e) In the last year for the Bachelor's degree the full tuition of \$125 is charged.
  - (f) The minimum tuition fee is \$15.
- |   |       |
|---|-------|
| 8. For Courses leading to the Master's degrees and degrees in Engineering | \$100 |
| 9. For Courses leading to the degree of Doctor of Philosophy              | 200   |
| 10. Graduation fee  | 10    |

## LABORATORY MATERIAL AND DEPOSIT FEES.

11. Chemistry, Course 2 or 3 . . . . .	\$10
12. Deposit for breakage, Chemistry 2 or 3 . . . . .	10
13. Chemistry Courses, except 2 and 3 . . . . .	25
14. Deposit for breakage, Chemistry Courses, except 2 and 3 . . . . .	25
15. Assaying of ores and bullion . . . . .	20
16. Physics . . . . .	10
17. Electricity . . . . .	10
18. Botany . . . . .	10
19. Zoölogy . . . . .	10
20. Mineralogy . . . . .	10

All tuition fees are payable semi-annually in advance.

NOTE.—*Students withdrawing before the close of an academic year are required to give immediate written notice to the Registrar of the University, otherwise no deduction from the full year's fees will be made.*

## ROOMS AND BOARD.

Desirable rooms, convenient to the University buildings, and good board are obtainable at moderate prices. A list of eligible boarding-houses will, upon request, be furnished by the Registrar of the University.

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For catalogues, application blanks, and further information regarding the Department of Arts and Sciences, address

CHANNING RUDD, *Registrar,*  
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Washington, D. C.

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Bodmer, Annie Elizabeth.....	D. C....	1325 1st Street, S. W.
Bradshaw, Henry.....	D. C....	901 C Street, N. E.
Bradshaw, May Paul.....	D. C....	901 C Street, N. E.
Brown, Robson De. S.....	Iowa....	503 S Street.
Burgdorf, Ada Belle.....	D. C....	512 6th Street.
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Burt, Hugh Valentine.....	W. Va..	Mannington, W. Va.
Capell, Isabel Rhoda.....	N. Y....	308 I Street.
Cole, Mary B.....	N. Y....	The Fredonia.
Colestock, Harry Ludwig.....	Pa.....	140 S Street.
Cragin, Harry Seymour.....	D. C....	903 M Street.
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Lee, Walter Howell.....	D. C....	Anacostia, D. C.
Luckett, George Sparr.....	D. C....	504 A Street, S. E.
Lyon, Robert Isaac.....	D. C....	112 2d Street, S. E.
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*Department of Arts and Sciences.*

91

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Watkins, Rhoda .....	Pa.....	1412 14th Street.
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Jewell, Benson Mundy.....	Ill.....	617 19th Street.
Johnson, Harry Done.....	Mo. ....	Takoma Park, D. C.
Keene, Herbert Newton ..	D. C....	208 Elm Street.
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McCabe, John Joseph....	D. C....	214 T Street.
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Warburton, Clyde W.....	Iowa.....	735 13th Street.
Wilson, Clarence Paret.....	Md.....	Agricultural Department.
Wolfe, Edmund Stanley.....	Md.....	2104 1st Street.
Wolfe, James Thurston.....	Va.....	737 13th Street.
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Woodward, Mark Rittenhouse.....	D. C.....	125 New York Avenue.
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Brearley, James Alfred.....	Pa.....	306 10th Street, S. E.
Brecht, Christine Duvall.....	D. C....	609 22d Street.
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Bride, William Witthaft.....	D. C....	129 B Street, S. W.
Brown, Catharine Frease.....	Kansas..	1009 13th Street.
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B. S., Lafayette College.		
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Burner, Charles Edwin.....	D. C....	1203 S Street.
Caldwell, Alexander Halsted..	D. C....	1462 Binney Street.
Carkhuff, Warren.....	Fla....	1809 I Street.
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Cary, Arthur Franklin.....	Mass....	Tennallytown, D. C.
Charles, Seward.....	Ill.....	1203 Q Street.
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Daly, John Francis.....	Mass....	210 T Street.
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De Land, Herbert Stanley.....	N. Y....	918 14th Street.
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Johnson, Anna Emaline.....	Va.....	1016 D Street, N. E.
Kenealy, Diehl Margaret.....	D. C....	3 I Street, N. E.
Keneipp, Hugh.....	Ill....	136 D Street, S. E.
Kemp, John S.....	Va.....	433 G Street.
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Magruder, Bruce	D. C. ....	Wisconsin Avenue, Sta. A
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Merwin, Charles Merrill	N. J. ....	917 Westminster Place.
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Ossire, Cora Amelia	D. C. ....	2721 P Street.
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B. S., M. A., Columbian University.		
Parker, William Everette	R. I. ....	1808 Kalorama Avenue.
Parker, William Thomas	Neb. ....	17 3d Street, N. E.
Parsons, John	Ky. ....	Dep't Comm. and Labor.
Patterson, Elsie Lillian De Wolf	Mass. ....	926 Massachusetts Ave.
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Robinette, Fred Garfield.....	Pa.....	301 Maryland Ave., N. E.
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Shoemaker, William David.....	N. Y. ...	640 F Street, S. W.
Smith, Henry Herbert.....	Md.....	Wash. Savings Bank.
Smith, L. Scott.....	N. H. ...	525 T Street.
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A. B., Harvard University.		
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Stutler, Hiram Ward.....	W. Va. ...	316 M Street.
Sullivan, Francis Paul.....	D. C. ...	1823 Vernon Street.
Taylor, Emma Louise.....	D. C. ...	1825 F Street.
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99

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Turner, Frank Asbury	D. C. . . .	414 B Street, N. E.
Underwood, Mary Louise.	D. C. . . .	129 6th Street, N. E.
Upton, Katharine Gannett	D. C. . . .	3408 Morgan Avenue.
Voss, Edna Renard	D. C. . . .	1300 Lydecker Avenue.
Wallace, Sarah Agnes.	D. C. . . .	1425 Q Street.
Ph. B., University of Chicago.		
M. A., Columbian University.		
Walter, Frank Keller	Pa. . . .	1811 I Street.
A. B., A. M., Haverford College.		
Whitfield, Joseph Aloysius.	D. C. . . .	142 U Street.
Wiegand, Gustav William.	Minn. . . .	900 K Street.
Williams, Lucia Kirk	D. C. . . .	1404 L Street.
Williams, Mack.	Iowa . . .	242 Delaware Ave., N. E.
Williamson, Willard Delmont	D. C. . . .	614 E Street, N. E.
Wilson, Archibald Henry	Mass. . . .	1317 13th Street.
S. B., Massachusetts Institute of Technology.		
Winter, Max Wilhelm.	Neb. . . .	814 A Street, S. E.
Witten, Aubrey Bowen	D. C. . . .	1901 5th Street.
Witten, Hazel Bradford	Mo. . . .	1901 5th Street.
Wright, Albert Eugene	Mich. . . .	62 Seaton Street.
Wright, Ida Granger	D. C. . . .	122 Maryland Ave., N. E.
Worcester, William Franklin	Wis. . . .	Census Office.

*Auditors.*

Bowker, Eleanor Armington.	N. H. . . .	8 Grant Place.
Ford, Ella May	D. C. . . .	47 R Street.
Frank, Mary Woods.	D. C. . . .	1821 Riggs Place.
Holbrook, Elinor Beebe	Mass. . . .	1751 Corcoran Street.
Kerfoot, Ida Cushman.	Va. . . .	1430 Rhode Island Ave.
Perkins, Elizabeth Mary	D. C. . . .	1119 S Street.
A. B., Ph. D., Bryn Mawr College.		
Slater, Ora Winona Louise.	N. J. . . .	1751 Corcoran Street.
A. B., Wellesley.		
Warren, Mrs. Annie Kirkland	Ala. . . .	1709 9th Street.
Welch, Williams.	S. C. . . .	32 Grant Place.
Yoshino, Shogaburo	Japan . .	Howard University.

## GRADUATE STUDENTS.

*Candidates for the Degree of Civil Engineer.*

Name.	Legal address.	City address.
Cleary, James Douglas.....	D. C....	612 22d Street.
B. S., Columbian University.		
Fischer, Guillermo Gustavo.....	Cuba ...	1534 I Street.
A. B., B. S., Havana University.		
Gordon, John Blake.....	D. C....	6 Cooke Place.
B. S., Columbian University.		
Holton, Douglas Winfield.....	Vt. ....	1227 L Street.
B. S., University of Vermont.		
Reyes, Jose Vano.....	P. I....	Coast & Geodetic Survey.
A. B., St. Tomas, Manila.		
A. M., Barcelona University, Spain.		
M. E., Barcelona.		

*Master of Arts.*

Alden, Levi Russell.....	D. C....	809 L Street.
B. A., Columbian University.		
Topic, American History.		
Ames, Gladys.....	D. C....	1701 21st Street.
B. A., Columbian University.		
Topic, English.		
Charles, Audason Alexander.....	Ind. ...	Patent Office.
B. A., Indiana University.		
Topic, Chemistry.		
Merritt, Ella Arvilla..	Minn...	154 F Street, S. E.
B. A., Columbian University.		
Topic, English.		
Paddock, Rev. Ernest Moorehead...	Pa.....	1723 H Street.
A. B., University of Pennsylvania.		
Theological School, Cambridge, Mass.		
Topic, Philosophy.		
Partee, Sawyer Wilson.....	Ky.....	519 2d Street.
A. B., Georgetown College, Ky.		
Topic, History.		
Peake, James Frederick .....	Va.....	616 9th Street.
A. B., Randolph-Macon College.		
Topic, History.		
Randall, Arthur Theodore....	Ill.....	518 12th Street, N. E.
M. D., Northwestern University.		
Topic, Philosophy.		
Smith, Charles Harper .....	Ind.....	1224 13th Street.
A. B., Earlham College.		
A. B., Haverford College.		
Topic, German.		

*Department of Arts and Sciences.*

101

Name.	Legal address.	City address.
Stabler, Nora Leland.....	Md.....	The Regina.
A. B., Swarthmore College.		
<i>Topic, English.</i>		
Waring, Luther Hess.....	Pa.....	307 B Street, S. B.
<i>Topic, Economics.</i>		
West, Harold Preston.....	Me.....	1337 15th Street.
B. A., Bowdoin College		
<i>Topic, French.</i>		

*Master of Science.*

Gerdson, William Cornelius .....	Minn....	Patent Office.
<i>Topic, Chemistry.</i>		
Jones, Ernest Evans.....	Ind.....	1211 13th Street.
B. S., Earlham College.		
<i>Topic, Chemistry.</i>		
Prentiss, Elliott Coues.....	D. C....	1305 Rhode Island Ave
B. S., M. D., Columbian University.		
<i>Topic, Neurology.</i>		
Richards, Luther Adolph.....	Va.....	1100 New York Avenue.
B. A., M. A., Columbian University.		
<i>Topic, Astronomy.</i>		

*Dodor of Philosophy.*

Bassler, Ray Smith.....	Ohio....	U. S. National Museum.
B. A., University of Cincinnati.		
M. S., Columbian University.		
<i>Topics—Major, Paleontology; Minors,</i>		
<i>Economic Geology and Zoology.</i>		
Church, Calvin Grant.....	Md.....	The Lincoln.
B. S., Maryland Agricultural College		
M. S., Columbian University.		
<i>Topics—Major, Agricultural Chemistry.</i>		
<i>Minors, Physical Chemistry, Analytical</i>		
<i>Chemistry.</i>		
Coleman, William Macon.....	D. C. ..	518 9th Street.
A. B., A. M., University of North Carolina.		
<i>Topics—Major, History; Minors, History</i>		
<i>of Roman Republic, History of Philoso-</i>		
<i>phy.</i>		
Day, Herbert Ernest.....	Conn...	Kendall Green
Ph. B., 1893, Brown University		
M. A., 1895, Gallaudet College		
M. A., 1900, Columbian University.		
<i>Topics—Major, English; Minors, Ameri-</i>		
<i>can History, American Literature.</i>		
Doyle, Aida Mary.....	Pa.....	1902 3d Street.
B. S., M. S., Columbian University.		
<i>Topics—Major, Chemistry; Minors, Agri-</i>		
<i>cultural Chemistry, Geology.</i>		

Name.	Legal address.	City address.
Fleishman, Arthur Cary.....	Ky.....	117 7th Street, N. E.
B. S., M. S., National Normal University.		
M. A., Columbian University		
Topics—Major, Philosophy; Minors, Sociology, Pedagogy or Political Science.		
Freeman, John Thomas.....	D. C....	2d and I Street.
B. S., M. S., Dartmouth College.		
Topics—Major, Economics; Minors, History, Civil Engineering.		
Hall, Percival.....	D. C....	Kendall Green.
A. B., Harvard College.		
M. A., Gallaudet College.		
M. A., Columbian University.		
Topics—Major, Pure Mathematics; Minors, Applied Mathematics, Astronomy.		
Hau, Carl.....	Germany.	1631 19th Street.
M. A., Columbian University.		
Topics—Major, Continental History; Minors, Comparative Politics, International Law.		
Hinman, Ida.....	Iowa ...	1446 Rhode Island Ave.
B. S., 1892, Iowa Wesleyan University.		
M. A., 1902, Columbian University.		
Topics—Major, English; Minors, German, French.		
Kimball, Herbert Harvey.....	N. H....	U. S. Weather Bureau.
B. S., New Hampshire College of Agriculture and the Mechanic Arts		
M. S., Columbian University.		
Topics—Major, Astro-Physics; Minors, Meteorology, Practical Meteorology.		
Lawson, Huron Willis.....	Mich...	1122 N. H. Avenue.
B. S., Michigan State Agricultural College.		
M. D., Columbian University.		
Topics—Major, Neurology; Minors, Botany, Zoology.		
Lyon, Marcus Ward, Jr....	N. J....	National Museum.
Ph. B., Brown University.		
M. S., M. D., Columbian University.		
Topics—Major, Zoology; Minors, Neurology, Histology.		
Mattern, Louis Wilson.....	Pa.....	McKinley M. T. School.
B. S., Pennsylvania State College		
Topics—Major, Chemistry; Minors, Biochemistry, Physical Chemistry.		
Mills, Joseph Strayer.....	Md.....	Central High School.
B. A., M. A., Western Maryland College.		
Topics—Major, Chemistry; Minors, Mineralogy, Physics.		

- | Name.  | Legal address. | City address.                                   |
|--|----------------|---|
| Monaghan, James Charles .....  | D. C. ....     | 1335 F Street.                                  |
| A. B., A. M., Brown University.  |                |   |
| Topics—Major, German History; Minors, International Law, Constitutional Law.                           |                |   |
| Newberne, Robert Edward Lee .....  | Texas ..       | 914 New York Avenue.                            |
| M. D., Georgetown University.  |                |   |
| D. D. S., Tacoma College of Dental Surgery.  |                |   |
| B. S., M. S., Columbian University.  |                |   |
| Topics—Major, Neurology; Minors, Anatomy, Physiology.  |                |   |
| Newton, Elmer Slayton .....  | Mass....       | The Brunswick.                                  |
| B. A., Amherst College.  |                |   |
| Topics—Major, Bio-Chemistry; Minors, Bacteriology, Organic Chemistry.                                  |                |   |
| Orth, Henry, Jr. ....  | D. C. ....     | 1011 L Street.                                  |
| M. S., Lehigh University.  |                |   |
| M. S., Columbian University.   |                |   |
| Topics—Major, Physical Chemistry; Minors, Organic Chemistry, Theoretical Chemistry.                    |                |   |
| Patrick, George Edward .....   | Iowa ...       | Bureau of Chemistry, Department of Agriculture. |
| B. S., M. S., Cornell University.  |                |   |
| Topics—Major, Agricultural Chemistry; Minors, Bio-Chemistry, Bacteriology.                             |                |   |
| Phalen, William Clifton .....  | Mass....       | U. S. National Museum.                          |
| B. S., M. S., Massachusetts Institute of Technology.   |                |   |
| Topics—Major, Geology; Minors, Petrography, Paleontology.  |                |   |
| Phelan, Warren Waverly .....   | N. Y....       | 822 Connecticut Avenue.                         |
| B. A., M. A., Columbia University.   |                |   |
| Topics—Major, Comparative Jurisprudence; Minors, German and Continental History, Political Philosophy. |                |   |
| Quick, Oscar .....   | Ill. ....      | U. S. Patent Office.                            |
| A. B., A. M., Harvard University.  |                |   |
| Topics—Major, Astro-Physics; Minors, Meteorology, Astronomy.   |                |   |
| Ransom, Brayton Howard. ....   | Neb....        | 1362 B Street, S. W.                            |
| B. S., M. A., Nebraska.  |                |   |
| Topics—Major, Zoology; Minors, Anatomy, Physiology.  |                |   |
| Solyom, Herbert Louis .....  | Md....         | Patent Office.                                  |
| B. S., M. S., Columbian University.  |                |   |
| Topics—Major, Astro-Physics; Minors, Meteorology, Economics.   |                |   |

Name.	Legal address.	City address.
<b>Straughn, Martin Norris</b> .....	Md.....	College Park, Md.
B. S., Maryland Agricultural College.		
M. S., Columbia University.		
<i>Topics</i> —Major, Agricultural Chemistry;		
Minors, Physical Chemistry, Analytical Chemistry.		
<b>Van Vleck, Frank</b> .....	Cal.....	Navy Department
M. E., Stevens Institute of Technology.		
<i>Topics</i> —Major, Mechanical Engineering;		
Minors, Electricity, Hydraulics.		
<b>Ward, Rev. Andrew Norman</b> .....	Md.....	124 7th Street, S. E.
A. B., 1895, Western Maryland College.		
M. A., 1900, Columbia University		
<i>Topics</i> —Major, English; Minors, Biblical Literature, History		
<b>Welsh, John Cleveland</b> .....	Tenn...	229 F Street, N. E.
B. S., Carson and Newman College.		
M. S., Columbia University.		
<i>Topics</i> —Major, Electro-Chemistry; Mi-		
nor, Organic Chemistry, Alternating Currents in Electricity.		
<b>Wilkinson, Oscar</b> .....	Miss....	1404 L Street.
Ph. B., University of Mississippi		
M. A., Columbia University.		
M. D., Tulane University.		
<i>Topics</i> —Major, Physiological Optics; Mi-		
nor, Therapeutics, Practice of Medi-		
cine.		
<b>Wilson, Andrew</b> .....	D. C....	1315 Wallach Place.
B. S., B. O., B. A., M. A., Kansas Normal College.		
L.L. B., LL. M., Georgetown University.		
M. L., D. C. L., Yale University		
<i>Topics</i> —Major, History; Minors, Philoso-		
phy, Political Science.		
<b>Witherspoon, Thomas Alfred</b> ...	Tenn...	U. S. Patent Office
Graduate U. S. Naval Academy.		
L.L. B., M. S., Columbia University		
<i>Topics</i> —Major, Physical Chemistry; Mi-		
nor, Chemistry, Electricity		

Total number of students. .... 452

## Teachers' Courses.

The University has offered to teachers in the public schools of Washington, during the academic year of 1903-04, the following free courses of instruction:

### ANATOMY, PHYSIOLOGY, AND HYGIENE.

Topic.	Lecturer.
Outline Anatomy of the Human Skeleton . . . . .	Professor Shute.
Outline Anatomy of the Viscera . . . . .	Professor Shute.
Physiology of Individual Cells . . . . .	Professor Carr.
Physiology of the Nervous System . . . . .	Professor Carr.
Physiology of the Alimentary System . . . . .	Professor Carr.
Special Anatomy of the Brain . . . . .	Professor Shute.
Toxines and Antitoxines . . . . .	Dean de Schweinitz.
Osmosis . . . . .	Professor Munroe.
Foods and Feeding . . . . .	Professor Wiley.
Nutrition . . . . .	Professor Wiley.
Infection, Disinfection, and Immunity . . . . .	General Sternberg.
Infection, Disinfection, and Immunity . . . . .	General Sternberg.

### CIVICS.

Topic.	Lecturer.
History of Diplomacy and Treaties of the United States . . . . .	Professor Foster.
Constitutional Law of the United States . . . . .	Justice Harlan.
Comparative Constitutional Law . . . . .	Dean Tucker.
International Public Law . . . . .	Justice Brewer.
English Common Law . . . . .	Professor Taylor.
Comparative Politics and Political Geography . . . . .	Professor Swisher.
Comparative Politics and Political Geography . . . . .	Professor Swisher.
Interstate and Foreign Commerce . . . . .	Professor Austin.
International Trade and Commercial Geography . . . . .	Professor Crowell.
Transportation and Interstate Commerce Law . . . . .	President Needham.
The Census of Manufactures in the United States . . . . .	Director North.
The Development of Manufactures in the United States . . . . .	Director North.

## EVOLUTION OF THE DRAMA.

Topic.	Lecturer.
Greek Tragedy . . . . .	Professor Carroll.
Greek Comedy . . . . .	Professor Carroll.
The Roman Drama . . . . .	Professor Pease.
The Drama in France . . . . .	Professor Henning.
The Drama in France (continued) . . . . .	Professor Henning.
The Drama in Germany . . . . .	Professor Schoenfeld.
Ibsen and Bjornsen . . . . .	Professor Schoenfeld.
Jewish Dramatic Literature . . . . .	Doctor Adler.
Rise of the English Drama . . . . .	Professor Wilbur.
The Shakesperean Drama . . . . .	Mr. McElroy.
The Shakesperean Drama . . . . .	Mr. McElroy.
The Place of Music in the Development of the Drama . . . . .	Mr. King.

These courses are conducted under the following conditions: Applications for admission are made to the Superintendent of Schools. On the completion of the course each teacher submits a note book on the course for examination, and presents an essay on a prescribed topic within the course. If these prove satisfactory a certificate is conferred by the University.

Teachers were enrolled for the courses as follows:

*Anatomy, Physiology, and Hygiene.*

Miss E. W. Cross . . . . .	The Berkshire.
Miss Edith Grosvenor . . . . .	1657 31st Street.
Miss S. J. Hadley . . . . .	25 Iowa Circle.
Miss Rose Holmes . . . . .	1204 Massachusetts Avenue.
Miss E. S. Jacobs . . . . .	921 P Street.
Miss L. W. Johnson . . . . .	1529 Q Street.
Miss Ruth Oberly . . . . .	The Mendota.
Miss E. W. Saxton . . . . .	1445 Huntington Place.
Dr. Rebecca Stonerod . . . . .	1330 Wallach Place.
Miss Marian White . . . . .	330 T Street.
Miss Helen D. Wise . . . . .	1514 13th Street.
Miss Fannie Woolverton . . . . .	1216 Princeton Street.

*Civics.*

Miss C. G. Brewer . . . . .	The Stratford.
Miss E. M. Chase . . . . .	1363 Yale Street.
Miss A. M. Clayton . . . . .	Takoma Park, D. C.
Miss N. B. Croswell . . . . .	1323 Emerson Street, N. E.
Miss A. Davis . . . . .	213 C Street, S. E.

*Teachers' Courses.*

107

Miss C. L. Garrison	1304 Yale Street.
Miss A. L. Grant	212 5th Street, N. E.
Miss M. E. Kealey	715 East Capitol Street.
Mr. S. E. Kramer	1318 S Street.
Miss S. A. Langley	311 6th Street, S. E.
Miss M. E. Little	418 6th Street.
Mrs. M. R. McCauslen	710 East Capitol Street.
Miss Effie Macfarlane	920 11th Street.
Miss M. C. McGill	1345 Corcoran Street.
Miss N. E. L. McLean	1307 R Street.
Mr. B. W. Murch	627 Florida Avenue, N. E.
Miss J. M. Rawlings	517 A Street, S. E.
Miss K. E. Rawlings	3445 Holmead Avenue.
Miss F. L. Reeves	730 22d Street.
Miss S. E. White	1420 Kenesaw Avenue.

*Evolution of the Drama.*

Miss Rose M. Bogan	606 Massachusetts Avenue.
Miss Mary P. Bradshaw	901 C Street, N. E.
Miss Katherine Burden	1309 Riggs Place.
Miss Lillian Carpenter	205 D Street, N. E.
Miss Edna A. Clark	1424 11th Street.
Miss Adelaide Davis	213 C Street, S. E.
Miss Harriet C. Lasier	1427 Binney Street.
Miss Agnes I. Little	Wallach School.
Miss Sara P. Lynch	Brookland, D. C.
Miss Lulu McNally	13 6th Street, N. E.
Miss Avice I. Magee	2211 I Street.
Miss Mary R. Parkman	800 E Street, N. E.
Miss Katherine M. Raber	1101 K Street.
Miss Amelia Rakeman	1221 12th Street.
Miss Theodosia R. Rupli	174 P Street.
Miss Rebecca E. Shanley	Business High School.
Miss Blanche L. Steel	1765 R Street.
Miss Frances E. Throckmorton	1449 N Street.
Miss Isa W. Vanderwerker	412 C Street, S. E.
Miss Helen I. Walsh	1261 Kenesaw Avenue.
Miss Mary L. Walter	1331 11th Street.
Miss Elizabeth R. Walton	2005 G Street.
Miss Josephine M. Wharton	1721 Q Street.
Miss Mabel G. White	424 11th Street, S. E.
Miss Bessie L. Yoder	124 11th Street, S. E.

Total. . . . . 57

## Department of Medicine.

### FACULTY.

- CHARLES W. NEEDHAM, LL. D.,  
President of the University.
- \* EMIL A. DE SCHWEINITZ, Ph. D., M. D., Dean,  
Professor of Chemistry and Toxicology.
- D. KERFOOT SHUTE, A. B., M. D., Dean *pro tempore*.  
Professor of Anatomy and Clinical Ophthalmology.
- J. FORD THOMPSON, M. D.,  
Professor of Surgery and Clinical Surgery.
- ALBERT F. A. KING, A. M., M. D., Dean Emeritus.  
Professor of Obstetrics and the Diseases of Women and Children.
- WILLIAM P. CARR, M. D.,  
Professor of Physiology and Professor of Clinical Surgery.
- STERLING RUFFIN, M. D.,  
Professor of the Theory and Practice of Medicine and Professor of Clinical Medicine.
- THOMAS A. CLAYTOR, M. D.,  
Professor of Materia Medica and Therapeutics and Professor of Clinical Medicine.
- HENRY C. YARROW, M. D.,  
Professor of Dermatology and Clinical Dermatology.
- HENRY L. E. JOHNSON, M. D.,  
Professor of Clinical Gynecology.
- THOMAS E. MCARDLE, A. M., M. D.,  
Professor of Minor Surgery.
- WILLIAM K. BUTLER, A. M., M. D.,  
Professor of Ophthalmology and Clinical Ophthalmology.
- CHARLES W. RICHARDSON, M. D.,  
Professor of Laryngology and Otology and Clinical Laryngology and Otology.
- A. R. SHANDS, M. D.,  
Professor and Clinical Professor of Orthopedic Surgery.

\* Died February 15, 1904

(108)

- JOHN VAN RENSSELAER, A. B., M. D.,  
Professor of Clinical Surgery.
- W. F. R. PHILLIPS, M. D.,  
Professor of Hygiene.
- GEORGE N. ACKER, A. M., M. D.,  
Professor and Clinical Professor of Paediatrics and Clinical  
Medicine.
- G. WYTHE COOK, M. D.,  
Professor of Clinical Medicine.
- J. WESLEY BOVÉE, A. M., M. D.,  
Professor of Clinical Gynecology.
- RANDOLPH B. CARMICHAEL, M. D.,  
Professor of Clinical Dermatology.
- WM. A. WHITE, M. D.,  
Professor and Clinical Professor of Mental Diseases.
- JULIAN M. CABELL, M. D.,  
Associate Professor of Obstetrics.
- W. C. WOODWARD, M. D., LL. M.,  
Professor of Medical Jurisprudence.
- JAMES CARROLL, M. D.,  
Associate Professor of Pathology and Bacteriology.
- JOHN B. NICHOLS, M. D.,  
Professor of Normal Histology.
- J. H. FORD, B. S., M. D.,  
Professor of Tropical Diseases.
- FRANCIS R. HAGNER, M. D.,  
Clinical Professor of Genito-Urinary and Venereal Diseases.
- ALBERT L. STAVELEY, M. D.,  
Clinical Professor of Gynecology.
- W. L. ROBINS, M. D.,  
Clinical Professor of Nervous Diseases.
- J. F. MITCHELL, M. D.,  
Professor of Surgical Pathology.
- CHANNING RUDD, D. C. L.,  
Registrar of the University.

DEMONSTRATORS.

- W. F. R. PHILLIPS, M. D.,  
Demonstrator of Anatomy.

- EDWARD G. SEIBERT, M. D.,  
Associate in Chemistry in Charge of Chemical Laboratory.
- FRANCIS P. MORGAN, A. B., M. D.,  
Assistant to the Chair of Materia Medica and Therapeutics,  
in Charge of the Pharmacy Laboratory.
- L. W. GLAZEBROOK, M. D.,  
Curator of the Museum and Demonstrator of Pathological  
Anatomy.
- D. W. PRENTISS, M. D.,  
Demonstrator of Normal Histology.
- |                            |                               |
|----------------------------|-------------------------------|
| VIRGIL B. JACKSON, M. D.,  | E. Y. GILCHRIST, M. D.,       |
| GEORGE B. HEINECKE, M. D., | T. S. D. GRASTY, M. D.,       |
| E. E. RICHARDSON, M. D.,   | E. C. PRENTISS, B. S., M. D., |
| E. P. COPELAND, M. D.,     | JOS. D. RODGERS, M. D.,       |
| W. A. FRANKLAND, M. D.,    | A. C. FITCH, Phar. D., M. D., |
| S. H. GREENE, JR., M. D.,  | H. W. LAWSON, B. S., M. D.,   |
| J. L. RIGGLES, M. D.,      | C. M. BEALL, M. D.,           |
| R. M. LITTLE, M. D.,       | GILMER BRENNER, A. B., M. D., |
- Assistant Demonstrators of Anatomy.
- E. J. S. LUPTON, B. S., M. D.,  
Assistant.
- GEORGE B. HEINECKE, M. D., E. E. RICHARDSON, M. D.,  
Prosectors to the Chair of Anatomy.
- FRANK LEECH, M. D., EDGAR COPELAND, M. D.,  
Demonstrators of Minor Surgery.
- EDWARD E. MORSE, M. D.,  
Demonstrator of Obstetrics.
- B. L. HARDIN, M. D.,  
Associate in Physical Diagnosis.
- W. B. JOHNSTON, M. D.,  
Assistant in Physical Diagnosis.
- T. S. D. GRASTY, M. D., E. L. MASON, M. D.,  
E. E. BUTTERFIELD, M. D.,  
Demonstrators of Bacteriology and Pathology.
- L. H. REICHELDERFER, M. D., H. C. MACATER, M. D.,  
Instructors in Medicine.
- H. S. MEDFORD, M. D.,  
Instructor in Obstetrics.
- E. P. COPELAND, M. D.,  
Instructor in Surgery.

*Department of Medicine.*

111

- G. BROWN MILLER, M. D.,  
Instructor in Gynecology.  
C. S. WHITE, M. D.,  
Instructor in Physiology.  
J. S. RIGGLES, M. D.,                      ✓ E. C. PRENTISS, B. S., M. D.,  
GEO. M. RUFFIN, M. D.,  
Instructors in Anatomy.

HOSPITAL AND DISPENSARY STAFF.

*Surgery.*

- J. FORD THOMPSON, M. D., and W. P. CARR, M. D.  
Associate: John Van Rensselaer, M. D. Assistants: R. S. Beale,  
M. D., J. C. Riggles, M. D., E. L. Mason, M. D., T. S. D. Grasty,  
M. D., James F. Mitchell, M. D.

*Medicine.*

- STERLING RUFFIN, M. D., and THOMAS A. CLAYTOR, M. D.  
Associates: G. N. Acker, M. D., and B. L. Hardin, M. D. (in Dis-  
pensary). Assistants: Thomas Dowling, M. D., E. P. Copeland,  
M. D., W. B. Johnston, M. D., W. Ashby Frankland, M. D.,  
Geo. M. Ruffin, M. D., S. H. Greene, Jr., M. D.

*Obstetrics and Gynecology.*

- A. F. A. KING, A. M., M. D.  
Associates in Gynecology: H. L. E. Johnson, M. D., and J. Wesley  
Bovée, M. D. Assistants: H. S. Medford, M. D., V. B. Jackson,  
M. D.  
Associates in Obstetrics: E. E. Morse, M. D., Julian Cabell, M. D.

*Diseases of the Eye.*

- D. K. SHUTE, A. B., M. D.  
Associate: W. K. Butler, M. D. Assistants: E. G. Seibert, M. D.,  
A. G. Kimball, M. D.

*Diseases of the Throat and Ear.*

- C. W. RICHARDSON, M. D.  
Assistants: O. A. M. McKinnis, M. D., E. G. Seibert, M. D., and  
H. S. Dye, M. D.

*Diseases of the Skin.*

- H. C. YARROW, M. D.  
Associate: R. B. Carmichael, M. D.

*Diseases of Children.*

T. E. MCARDLE, A. M., M. D.

Assistants: Frank Leech, M. D., and Edgar P. Copeland, M. D.

*Orthopedic Surgery.*

A. R. SHANDS, M. D.

Assistant: T. S. D. Grasty, M. D.

*Diseases of the Nervous System.**Genito-Urinary Diseases.*

FRANCIS R. HAGNER, M. D.

Assistant: (Henry R. Elliott) M. D.

*Clinical Laboratory.*

\* E. A. DE SCHWEINITZ, Ph. D., M. D.

Associates: James Carroll, M. D., Pathologist and Bacteriologist;  
J. B. Nichols, M. D., and W. B. Johnston, M. D. (Hæmatologist).Assistants: D. W. Prentiss, M. D., (L. L. Whitney, and Herschel  
Baldwin.*Pathologist.*

JAMES CARROLL, M. D.

Assistant: L. W. Glazebrook, M. D.

*Superintendent.*

H. C. MACATHE, M. D.

*Superintendent of Nurses and Matron.*

Miss MINNIE M. PAXTON.

*Resident Physicians.*

H. C. COBURN, JR., B. S., M. D.

C. V. NYMAN, Ph. G., M. D.

H. H. DONNALLY, A. M., M. D.

*Pharmacist.*

WILLIAM A. MESS,

*Externs.*

M. W. HOUGHTON,

F. YATES, M. D.

CARL LOVELACE, B. S., M. D.

\* Died February 15, 1904.

### NEW BUILDINGS.

Extensive additions and improvements have recently been made. A large and thoroughly appointed new hospital has been erected. This hospital is used to the highest degree possible for educational purposes as a part of the medical educational work of the University.

The new building for the Department of Medicine, completed, and occupied October, 1902, has a frontage of 50 feet and a depth of 144, giving a total floor area of 36,000 square feet, more than four-fifths of an acre, five stories in height. It has four large lecture halls, seating from 200 to 350 students each, large laboratories for chemistry, pharmacy, histology, physiology, bacteriology, pathology, and anatomy; recitation-rooms, professors' rooms, museum and reading-room, and study-rooms. Every facility is given, therefore, for the best of theoretical and practical work.

### ADMISSION.

Candidates for matriculation are required to show that they are fitted, by previous education, for the study of medicine, and for this purpose they must either pass an examination, or present a satisfactory certificate of their attainments from an approved school or college.

Students conditioned or unable to pass the examination in Latin or in Physics may obtain instruction on these subjects during the first year, and on passing a satisfactory examination before the beginning of the second year will be regularly matriculated.

### ADVANCED STANDING.

Students of other institutions who have attended one course of lectures in any regular medical school are placed upon the same footing as those who have attended one course in this Department, and those who have attended two (or three) courses of lectures in any other regular medical school or schools rank with those who have attended two (or three) courses in this Department, and the same privileges as regards examination are extended to them; they are admitted respectively as second, third, or fourth year students after passing a satisfactory ex-

amination upon the subjects required of our own students during the first, second, and third years, as previously described.

ADMISSION REQUIREMENTS FOR 1905.

To be admitted to the First-Year Class, after July 1, 1905, the applicant must show either a diploma or certificate from a reputable college granting the degree of A. B., B. S., or equivalent degree, or a diploma from a normal school established by State authority, or a high school of the first grade, or a medical student's certificate issued after an equivalent examination by a State Board, or a student's certificate of examination for admission to the freshman class of a reputable literary or scientific college; or a certificate of his having passed an examination conducted by certified examiners appointed by the State or District Superintendent of Public Instruction,

- (a) English Composition, Grammar, Rhetoric; the equivalent of two years' work in this branch.
- (b) Mathematics, including Arithmetic, Algebra, and Plane Geometry.
- (c) Latin; the equivalent of one year's study, covering at least one book of Cæsar's Commentaries or an equivalent thereof.
- (d) Elementary Physics.
- (e) United States History.
- (f) Three additional branches of the student's choice (each one to be an equivalent of a year's work), selected from the following: General History, Civics, English Literature, German, French, Latin (Cæsar, Virgil, or Cicero), Physiology, Botany, Zoölogy, Chemistry, Physical Geography.

In place of any part of this examination, official certificates will be accepted from the above-described schools. If the student should fail to pass in two-fifths of the branches of the examination, he will be admitted with the condition that he make up his deficiencies before entering the Second-Year Class. Instruction in the conditioned branches can be obtained from competent teachers for a small fee, and examinations will be held by official examiners at convenient times. The preliminary examination is not held by any person connected with the teaching staff of this Department.

## COURSES OF INSTRUCTION.

The system of instruction adopted by the Department of Medicine of this University comprises lectures and recitations on Anatomy, Histology, Physiology, Chemistry, *Materia Medica* and Therapeutics, Surgery, Minor Surgery, Orthopedics, Obstetrics, the Theory and Practice of Medicine, Pathology, Hygiene, Bacteriology, Otology, Laryngology, Gynecology, Dermatology, Ophthalmology, Mental Diseases, Medical Jurisprudence, Nervous Diseases, Pædiatrics, Laboratory instruction in Anatomy, Chemistry, Histology, and Pathological Histology, Bacteriology, Physiology, Pharmacy, Clinical Medicine, and Clinical instruction in Medicine, Obstetrics, Surgery, and the special subjects.

The eighty-third course of lectures begins on Wednesday, September 28, 1904.

The Introductory Lecture of the Course will be delivered by Professor Thomas A. Claytor, on September 28th, and the regular didactic lectures will continue throughout the session. Two courses of lecture, laboratory, and clinical work will be given during the year, the one beginning daily at 9.30 a. m., the other at 4.30 p. m. The student may select either course. The laboratories and dissecting-room are open at stated hours day and evening. There are practical clinics during the day.

## SURGERY.

Professor THOMPSON, Surgeon to the University Hospital, the Children's Hospital, and to the Garfield General Hospital.

The course embraces didactic lectures upon the Principles and Practice of Surgery, and, as far as practicable, clinical instruction in the Department.

As Professor THOMPSON is the attending Surgeon of the University, Children's, and Garfield Hospitals, students are offered the opportunity for Clinical Instruction in these Institutions.

Every effort is made to teach Surgery in accordance with the latest developments of scientific research. Operations are performed upon the cadaver, and the uses of all important surgical instruments and appliances are demonstrated in the same manner.

MINOR SURGERY.—Practical class instruction is given by Professor McARDLE and his assistants in the application of

splints, dressings, etc., for the various surgical diseases and injuries.

### OBSTETRICS AND GYNECOLOGY.

Professor KING, Obstetrician to the University Hospital,  
One of the Consulting Physicians to the  
Children's Hospital, etc.

This course comprises a series of lectures on the Science and Art of Midwifery, and on the Diseases of Women. The chief purpose of the lecturer is to arrange, simplify, and explain the matters studied in the text-books, so as to render them more easily intelligible, and to indicate their relative importance. The lectures are illustrated by diagrams, models, manikins, natural preparations, and instruments. The demonstrator of Obstetrics, Dr. Edward E. Morse, of the Columbia Hospital, demonstrates obstetric operations and students perform these operations upon the manikin, under his direction. This course is limited to fourth-year students, and all are required to take it before becoming candidates for graduation.

Clinical Instruction in Obstetrics will be given by Dr. Cabell at the Columbia Lying-in Hospital, and by Dr. King and his associates at the Columbian University Hospital. Recitations in Obstetrics will be held throughout the term by Dr. Homer S. Medford.

In the Department of Gynecology the various instruments and appliances used in treating the diseases of women are exhibited and their uses fully explained. Clinical instruction in Surgical Gynecology will be given by Prof. H. L. E. Johnson at the hospitals, where students will witness the various surgical operations required in gynecological cases. Recitations in Gynecology will be held throughout the term by Dr. G. B. Miller.

### ANATOMY.

Professor SHUTE, Ophthalmic Surgeon to the University Hospital, Columbia Hospital, the Government Hospital for the Insane, and to the Washington Hospital for Foundlings.

The instruction in Anatomy is given in a graded course of lectures, recitations from prescribed text-books, and especially by practical work in the dissection of the cadaver.

The lectures are illustrated by the use of dry and wet dissections of the cadaver, by models, diagrams, charts, and sciopicon views.

Special attention is given during the course to *Applied Anatomy*, which is of great importance in the practice of medicine.

**PRACTICAL ANATOMY.**—Practical work in osteology and in dissection are of fundamental importance. For the study of these subjects the students are divided into sections in order to make the instruction as practical and immediate as possible.

The bones of the skeleton are placed in each student's hands and he is instructed and quizzed upon all their important features.

The new dissecting-room of the Department is large, thoroughly ventilated, well-lighted and heated, and furnished with every requisite for the convenience and comfort of the student.

Laboratory instruction, in charge of the Professor of Anatomy and his Associate, is thorough and systematic.

#### GRADUATE COURSE IN NEUROLOGY.

This course includes laboratory work, readings, and recitations. The nervous system is investigated in typical animals of the different classes, especially with the view of gaining some insight into the phylogeny of the Central Nervous System in Man. The growth of the brain and its physical characters as related to intelligence are investigated. The histology and embryology of the Central Nervous System and the Sense Organs are studied. A history of the guiding conceptions in Neurology is to be acquired. The course is designed to inculcate a sound knowledge of the architecture and functions of the Nervous System of Man for the use of students of Anatomy, Medicine, and Psychology.

#### CHEMISTRY AND TOXICOLOGY.

*The vacancy caused by the death of Dr. de Schweinitz will be filled and announcements made in a later bulletin.*

This course embraces :

A short discussion of the principles of physics in their relation to chemistry, the principles of chemical philosophy, the laws of chemical combination and affinity.

The elements, metals and non-metals ; their methods of isolation, properties, compounds, and reactions, are studied.

Due attention is given to organic chemistry, especially those compounds that are of use in medicine, and also to physiological chemistry.

Laboratory instruction, in charge of the Professor of Chemistry and associate, Dr. E. G. Seibert, is given in the general methods of qualitative and quantitative analysis, volumetric analysis, toxicology, urine analysis, water analysis, and special clinical analyses.

#### GRADUATE COURSE IN BIOCHEMISTRY.

This course embraces, in addition to what is ordinarily called physiological chemistry, the following subjects:

- a.* A study of the products of the growth of germs, either in the animal body or upon artificial media.
- b.* The influence of these substances in causing disease and their relation to immunity.
- c.* The anti-toxins and methods of their preparation, hæmolytins, præcipitines, etc.
- d.* The preparation and properties of the enzymes will also be studied.

#### PHYSIOLOGY.

Professor CARR, Associate Surgeon to the University Hospital and Surgeon to the Central Dispensary and Emergency Hospital.

The subject is fully presented in a graded course of lectures covering the first two years.

The lectures are well illustrated by diagrams, models, and anatomical specimens, so as to make them clear in every detail.

A new physiological laboratory is ready for use, where students will be required to do practical work during the first and second years. This work will be in sections, and opportunity will also be given to advanced students for original research.

#### THEORY AND PRACTICE OF MEDICINE.

Professor RUFFIN, Physician to the University Hospital and Consulting Physician to St. Elizabeth's Hospital, and to the Central Dispensary and Emergency Hospital.

The student is urged to pay special attention to the course in Histology during the second year, as this is essential to a

proper understanding of the internal diseases of the human body. The courses in Pathology and Bacteriology should also receive the closest study, for without a clear knowledge of these subjects no satisfactory advance can be made.

The method of instruction employed in this subject is as follows :

1. Lectures, with weekly recitations.
2. Clinical lectures at the University Hospital, with practical instruction in the art of diagnosis and in the methods of taking and recording histories of medical cases.
3. Laboratory instruction in the use of instruments of research for the clinical study of the sputum, blood, feces, etc.
4. A course of lectures, with class instruction in physical diagnosis.

#### MATERIA MEDICA AND THERAPEUTICS.

Professor CLAYTOR, Physician to Garfield Hospital and to the University Hospital, Consulting Physician to St. Elizabeth's.

Instruction in this subject extends through the first three years, and embraces :

1. The study of crude drugs and their preparations, and the art of prescribing.
2. The physiological action of drugs in the human system.
3. The practical application of drugs and other therapeutical agencies to the prevention and cure of disease and the relief of suffering, together with their antidotal relations to poisons.

The subject is taught by means of lectures, recitations, and blackboard illustrations, and is simplified and made practical to as great a degree as is compatible with a sufficiently thorough understanding of its principles.

In connection with this chair is a pharmaceutical laboratory, under the immediate supervision of Dr. F. P. Morgan, well equipped with modern appliances, in which are taught the making of typical preparations of the Pharmacopœia, prescription writing, and the compounding of prescriptions. Practical instruction is also given in Electro-Therapeutics.

## DERMATOLOGY.

Professor YARROW, Dermatologist to the University Hospital and one of the Consulting Physicians to the Garfield Hospital, Children's Hospital, and Woman's Clinic.

Professor Yarrow lectures on this subject, illustrating it by diagrams, models, photographic illustrations of disease from life, and also by the exhibition of cases. In connection with the course, clinical instruction is given by Dr. Carmichael at the Central Dispensary and Emergency Hospital and the University Hospital, where an abundance of material affords excellent clinical advantages.

## PÆDIATRICS.

Professor ACKER, Associate Physician to the University Hospital and Physician to the Children's Hospital.

Didactic and clinical lectures are given upon diseases of infants and children and the importance of the proper management of these diseases by diet and hygiene.

## GYNECOLOGY.

Professor JOHNSON, Associate Gynecologist, University Hospital; Consulting Physician to Woman's Clinic and Washington Asylum Hospital.

Special clinical instruction in physical diagnosis. Operative work will be demonstrated as frequently as possible. The Professor has organized in connection with his service an outdoor maternity clinic, which is open to students.

## MINOR SURGERY.

Professor MCARDLE, Pædiatrician, University Hospital.

The course in Minor Surgery consists of lectures and practical demonstrations concerning bandaging, preparation of materials used in aseptic and antiseptic dressings, preparations for aseptic or antiseptic operations, strapping, vaccination, and other minor surgical procedures. Under the supervision of assistants, the students themselves apply the various splints, bandages, surgical dressings, etc.

OPHTHALMOLOGY.

Professor BUTLER, Ophthalmologist at Garfield Hospital, in Charge of the Lutheran Eye and Ear Infirmary, and Associate Ophthalmologist, University Hospital.

A didactic course on this subject is given, together with clinical instruction, at the Lutheran Eye and Ear Infirmary.

LARYNGOLOGY AND OTOTOLOGY.

Professor RICHARDSON, Laryngologist to the University, the Providence, and the Episcopal Eye, Throat, and Ear Hospitals.

This course comprises lectures and clinical instruction on diseases of the nasal passages, pharynx, larynx, and also the ear.

Practical demonstrations are given in the use of the laryngoscope and other instruments required in these special branches.

NERVOUS DISEASES.

Professor TOMPKINS, in Charge of the Department of Nervous Diseases at the Central Dispensary and Emergency Hospital, Associate in Nervous Diseases, University Hospital.

Lectures and clinics are given upon the more common and important nervous affections.

SURGICAL PATHOLOGY.

Professor J. F. MITCHELL, Associate, University Hospital.

This course is a series of lectures upon the pathological anatomy of surgical diseases and injuries and upon surgical bacteriology, illustrated by means of charts and photographs.

ORTHOPEDIC SURGERY.

Professor SHANDS, Orthopedist, University Hospital.

This course embraces didactic lectures on the Pathology, Etiology, course and termination of all chronic joint diseases, and,

as far as practicable, with clinical instruction on treatment of them according to the most modern orthopedic methods.

Special attention is given to the correction of all deformities, either acquired or congenital, by both mechanical and operative measures. There are afforded also practical illustrations as to applications of all the most modern orthopedic appliances.

Practical instruction is given in the application and use of plaster of Paris in the treatment of Pott's Disease, Scoliosis, Club Feet, etc.

#### HYGIENE.

Professor PHILLIPS, Climatologist, U. S. Weather Bureau.

The course in Hygiene is directed to teaching the relations of habits and surroundings to health. Consideration is given to domestic and municipal sanitation and to the principles underlying legislative interference in matters of public health.

#### BACTERIOLOGY AND PATHOLOGY.

Associate Professor CARROLL, Professor of Bacteriology and Clinical Microscopy, Army Medical School; Pathologist of the University Hospital, of Columbia Hospital, and Assistant Curator of the Army Medical Museum.

In this department an effort is made to give the student a practical knowledge, first, of the preparation of the various culture media, the principles of disinfection and sterilization, and the methods of cultivating, staining, and studying bacteria. Special attention is given to the pyogenic organisms and the bacilli of diphtheria and tuberculosis.

The latter half of the session is devoted to Pathology, and the student is now prepared to appreciate the association of these organisms with certain definite lesions in the tissues. After the detailed study of inflammation the diseases of the various organs are taken up in succession as far as possible. For this purpose sections illustrating the various pathological conditions are carefully selected and given to the student to be stained, mounted, and studied under the immediate supervision of the instructor. These sections become thereafter the property of the student. The course terminates with the microscopical study of the several varieties of tumors.

Advanced students who desire to continue the work will be encouraged to undertake bacteriological and pathological

studies of the cases that come to autopsy in the new University Hospital. In making selections from applicants, preference will be given to those who show the greatest aptitude during the regular course.

#### MENTAL DISEASES.

Professor WHITE, Superintendent of the Government Hospital for the Insane, St. Elizabeth's.

A series of lectures and clinics is given upon the subject of insanity in its varied forms.

#### CLINICAL MICROSCOPY.

Associate Professor CARROLL.

This course embraces the study of fresh and stained preparations of human blood in normal and pathological conditions; the Widal test for typhoid fever; the developmental stages of the malarial parasites in the blood and in the mosquito; the common forms of intestinal parasites and the microscopical examination of the urine. Opportunity will be afforded students who have taken the course to assist in the routine examinations of blood, sputum, urine, etc., in the hospital laboratory.

#### NORMAL HISTOLOGY.

Professor NICHOLS.

The course in Normal Histology is required of students in the second year, and extends throughout the session. The Histological Laboratory, open both day and evening, is amply equipped with microscopes, apparatus, and material for practical histological work and for purposes of instruction. A systematic presentation of the facts relating to cytology and the minute structure of the tissues and organs of the body is given by means of lectures, the study of microscopical specimens, and the projection microscope. Students are also given practical instruction in the manipulation and care of the microscope, in the preparation of specimens for microscopical examination, and in microscopical technique generally. Examinations are held at the close of the session.

## MEDICAL JURISPRUDENCE.

Professor WOODWARD, Health Officer of the District of Columbia.

This course is designed to familiarize students with the rights and obligations of physicians, both legal and ethical, and to qualify them to apply the facts of medical science to the solution of problems in law.

## LABORATORY INSTRUCTION.

As already noted in the introduction, the well-equipped new building is provided with modern laboratories for practical instruction in Anatomy, Physiology, Chemistry, Bio-Chemistry, Pharmacy, Normal Histology, Bacteriology, Pathological Histology, and Clinical Microscopy. These are large, well-lighted, and well-ventilated rooms, with a complete outfit of apparatus for each student. The desks are provided with water, gas, and steam and every facility for the best practical work. Great stress is laid upon laboratory work in all the subjects named.

The Pathological Museum is equipped with a large number of interesting and valuable specimens. Dr. L. W. Glazebrook, the Deputy Coroner of the District of Columbia, is Curator of the Museum, and from time to time adds valuable specimens to the collection.

## CLINICAL INSTRUCTION.

Attendance upon Clinical Instruction in Medicine and Surgery during at least two years is required, and upon other clinics as indicated by the special schedule. Records of attendance on these clinics will be kept and will duly affect the student's standing in his classes.

## TEXT-BOOKS AND WORKS OF REFERENCE.

(The works first named and in *italics* are preferred.)

**Anatomy.**—*Cunningham's Text-Book of Anatomy*; *Cunningham's Manual of Practical Anatomy*; *Treves's Applied Anatomy*; Wiedersheim's *Structure of Man*.

**Physiology.**—Kirke's; Stewart's *Manual*; Yeo's, or Landois & Sterling's *Physiology*.

- Chemistry.**—*Richler's*, *Remsen's*, *Simon's*, or *Fowne's Chemistry*; *Bowman's Medical Chemistry*; *Witthaus' Chemistry*; *Purdy's Ureanalysis*; *Remsen's Organic Chemistry*.
- Materia Medica.**—*H. C. Wood's Therapeutics*; *Hare's Practical Therapeutics*; *Culbreth's Materia Medica and Pharmacy*; *National Dispensatory*.
- Surgery.**—*American Text-Book of Surgery*; *Surgery by American Authors*, Park; *Surgical Pathology and Therapeutics*, Warren.
- Practice of Medicine.**—*Osler*; *Tyson*; *Anders*; *Thompson*, "Modern Medicine"; *Salinger-Kaltayer*; *Da Costa's Hare's Diagnosis*; *Musser's Diagnosis*; *Clinical Diagnosis*, *Simon*; *Klemperer*; *Clinical Examination of the Blood*, *Cabot*.
- Obstetrics.**—*Playfair's Obstetrics*; *American Text-Book of Obstetrics* (*Saunders*); *A. F. A. King's Manual of Obstetrics*; *Jewett's Practice of Obstetrics*.
- Gynecology.**—*Garrigue's Diseases of Women*; *Penrose, Diseases of Women*; *Montgomery's Text-book of Gynecology*; *Byford's Manual of Gynecology*; *Dudley's Gynecology*.
- Diseases of Children.**—*Holt on Diseases of Infants and Children*; *J. Lewis Smith*; *Koplik*; *Rotch's Work*.
- Histology.**—*Böhm*; *Davidoff*; *Piersol's*; *Nichols*; *Stöhr*; *Sabotta*.
- Pathology and Bacteriology.**—*Abbott's Principles of Bacteriology*; *Ziegler's Pathological Anatomy*.
- Hygiene.**—*Harrington's Practical Hygiene*; *Stephenson and Murphy's Treatise on Hygiene and Public Health*.
- Dermatology.**—*Hyde's Diseases of the Skin*; *Jackson's Diseases of the Skin*; *Duhring's Diseases of the Skin*.
- Ophthalmology.**—*Nettleship, de Schweinitz, or Fick*.
- Minor Surgery.**—*Wharton*.
- Nervous Diseases.**—*Text-book*, *Potts' Nervous and Mental Diseases*; *Oppenheim*, for Reference; *Gray*, *Mills*, *Church*, *Peterson*.
- Mental Diseases.**—*Beaven Lewis*.
- Orthopedic Surgery.**—*Bradford and Lovett's or Young's Orthopedic Surgery*.
- Laryngology and Otology.**—*Bacon*, *Buck*, *Dench on the Ear*; *Kyle*, *Price*, *Brown*, *F. S. Bishop on Throat Diseases*; *Diseases of Ear, Nose, and Throat*, by *Burnett*, *Ingals*, and *Newcomb*; *Diseases of Nose and Throat*, by *Shurley*; *Diseases of Nose and Throat*, by *Coakley*; *Posey and Wright's Ear, Nose, and Throat*.
- Medical Jurisprudence.**—*Reese, Medical Jurisprudence and Toxicology*; *Ewell*, *Medical Jurisprudence*; *Taylor, Law in its Relation to Physicians*; *Hamilton, System of Legal Medicine*; *Taylor's Manual*.
- Genito-Urinary and Venereal Diseases.**—*White and Martin*; *Hyde*, *Montgomery*, *Heys* and *Chetwood*.
- Dictionaries.**—*Dunghlison's*, *Duane's*, *Foster's*, *Gould's*, or *Dorland's*.

## GRADUATION.

Candidates for the degree of Doctor of Medicine must be of good moral character and at least twenty-one years of age; they must have studied medicine four years, and must have attended four courses of lectures, the subjects arranged as follows:

*First Year.*

Unless otherwise stated, numbers indicated below mean lecture hours per week.

Anatomy.—Six hours before, two hours after Christmas; two hours' recitation.

Physiology.—Four hours before, two hours after Christmas; two hours' recitation.

Chemistry.—Two hours before, two hours after Christmas; three hours' laboratory work.

Materia Medica.—Two hours before, two hours after Christmas; two hours' laboratory work.

Anatomical Laboratory.—Practical Osteology, forty hours' work during the term and practical dissecting. Dissection-room open from 12 m. to 3 p. m., and from 7.30 to 11 p. m.

Examination at the end of the year upon the above-named subjects.

*Second Year.*

Anatomy.—Three hours before, two hours after Christmas; two hours' recitation.

Physiology.—Four hours before, three hours after Christmas; two hours' recitation.

Chemistry.—Two hours before, two hours after Christmas; four hours' laboratory work.

Therapeutics.—Two hours before, two hours after Christmas; one hour recitation.

Minor Surgery.—One hour, October 9 to December 11, in manikin-room.

Histology.—Laboratory, day and evening.

Anatomical Laboratory, Practical Osteology and Practical Anatomy.—Dissection-room open from 12 m. to 3 p. m., and from 7.30 to 11 p. m.

Examination at the end of this year upon the above-named subjects.

*Third Year.*

Surgery.—Two hours before, two hours after Christmas ; one hour recitation.

Medicine.—Two hours before, two after Christmas ; one hour recitation.

Obstetrics.—Two hours before, two hours after Christmas ; one hour recitation.

Therapeutics.—Two hours before, two hours after Christmas ; one hour recitation.

Dermatology.—One hour, from January 8 to March 11.

Ophthalmology.—One hour, from October 9 to December 10.

Bacteriology and Pathology.—Nine hours' laboratory work per week.

Surgical Pathology.—One hour, from October 12 to December 21.

Clinics as scheduled.

Medical Jurisprudence.—One hour, October 10 to December 19.

Mental Diseases.—Two hours, January to April.

Hygiene.—Three hours, January 7 to January 29.

Examination on the above-named subjects at the end of the year.

*Fourth Year.*

Surgery.—Two hours before, two hours after Christmas ; one hour recitation.

Medicine.—Two hours before, two hours after Christmas ; one hour recitation.

Obstetrics.—Two hours before, two hours after Christmas ; one hour recitation.

Clinics and laboratory instruction.

Gynecology.—One hour, and clinics from October to May ; one hour recitation.

Nervous Diseases.—Three hours, from November 5 to November 26.

Pædiatrics.—One hour, and clinics from January to April.

Otology and Laryngology.—Three hours, from October 14 to November 29.

Orthopedic Surgery.—Three hours, from October 8 to October 29.

Clinics as scheduled.

Final examination at the close of the fourth year upon the above-named subjects.

The candidate must have dissected for at least two sessions, during each of which he will be required to dissect two "parts"

of a subject, and it is recommended that he dissect three parts. He must have attended also the required courses of clinical instruction in Medicine, Surgery, Obstetrics, and Special Branches.

One month before the close of the session he shall enter his name with the Dean of the Faculty as a candidate for graduation, and at the end of the term present himself for examination. The examination is both written and oral. The examination for the degree is held at the end of the session in May.

Graduates of other accredited medical schools must pass a satisfactory examination and attend one year before receiving a diploma from this University.

Students who fail to pass the examination in the spring may be allowed a reëxamination in the following fall *only*.

The diploma is presented at the Annual Commencement, and the degrees are conferred by Columbia University, incorporated by act of the Congress of the United States.

### CLINICAL INSTRUCTION.

**UNIVERSITY HOSPITAL.**—Clinical teaching is conducted in the *new and enlarged hospital* in conjunction with the didactic lectures in the various branches. The convenient location and the fact that the hospital is under the immediate control of the Medical Faculty offer unusual advantages to the students of this department.

**GARFIELD HOSPITAL.**—Clinical lectures are given regularly during the session by Professors Thompson and Van Rensselaer on Surgery, by Professors Cook and Claytor on Medicine, Carmichael on Dermatology, Butler on Ophthalmology, and Staveley on Gynecology. A great variety of medical and surgical diseases is to be seen in this institution, affording abundant material for clinical diagnosis and operative surgery.

**CHILDREN'S HOSPITAL.**—A weekly course of Surgical and Medical Clinics is given by Professors Thompson and Acker. An opportunity is here afforded for observing all the medical and surgical diseases, injuries, etc., to which children are liable. The Dispensary service of the Hospital is very large and instructive.

**CENTRAL DISPENSARY AND EMERGENCY HOSPITAL.**—Dr. Tompkins, in charge of nervous diseases. Dr. Shands on general medicine; Dr. Carmichael, in dermatology; and Dr. Hagner, in genito-urinary and venereal diseases, conduct courses of instruction in their respective branches.

PROVIDENCE HOSPITAL.—Clinical Instruction, both medical and surgical, is given by the staff of this institution. Gynecological clinics by Dr. J. W. Bovée.

LUTHERAN EYE AND EAR INFIRMARY.—The diseases of the eye and ear in this hospital are demonstrated during the clinics of Professor Butler.

EPISCOPAL HOSPITAL.—Dr. Richardson shows cases of diseases of the nose, throat, and ear in the dispensary service of this hospital.

COLUMBIA HOSPITAL.—Clinics and gynecological operations by Dr. Bovée.

ST. ELIZABETH'S.—Dr. A. B. Richardson, the superintendent, will give clinical instruction in mental diseases.

COLUMBIA HOSPITAL.—Dr. Cabell will give clinical instruction in obstetrics.

CLINICS, 1903-1904.

*University Hospital.*

Surgery.—Dr. Thompson, Tuesdays; Drs. Van Rensselaer and Carr.

Medicine.—Dr. Ruffin, Saturdays, at 4.30; Drs. Claytor and Acker.

*Dispensary Service.*

Surgical Diseases.—Dr. Copeland, Tuesdays, Thursdays, and Saturdays, 1 to 2 p. m.

Medical Diseases.—Dr. Hardin, Tuesdays, Thursdays, and Saturdays, 2 to 3 p. m.

Gynecology.—Dr. H. L. E. Johnson and Dr. Bovée, Wednesdays and Fridays, 1 to 2 p. m.

Diseases of the Eye.—Dr. Shute, Mondays and Thursdays, 2 to 3 p. m.

Diseases of the Ear and Throat.—Dr. Richardson, Mondays and Thursdays, 1 to 2 p. m.

Diseases of the Skin.—Drs. Yarrow and Carmichael, Mondays, 2 to 3 p. m.

Diseases of Children and Orthopedic Surgery.—Drs. McArdle and Shands, Wednesdays and Saturdays, 2 to 3 p. m.

Nervous Diseases.—Dr. Tompkins, Tuesdays and Fridays, 2 to 3 p. m.

Genito-Urinary and Venereal Diseases.—Dr. Hagner, Saturdays, 1 to 2 p. m.

*At the Garfield Hospital.*

Surgery.—Dr. Thompson, Sundays, at 10.30, November to April; Dr. Van Rensselaer, Sundays, at 10.30, October 1 to November 1.

Medicine.—Dr. Claytor, Tuesdays and Thursdays, at 4.15, October 1 to January 1; Dr. Cook, Tuesdays and Thursdays, at 4.15, January 1 to April 1.

Medical Dispensary Service.—Dr. Nichols, Mondays, Wednesdays, and Fridays, at 2 p. m.

Surgical Dispensary Service.—Dr. Francis R. Hagner, Tuesdays, Thursdays, and Saturdays, at 2 p. m.

Dermatology.—Dr. Carmichael, Saturdays, at 2 p. m.

Gynecology.—Dr. A. L. Staveley.

*At the Children's Hospital.*

Children's Diseases.—Dr. Acker, Wednesdays, at 4.15 p. m., January 1 to April 1.

Surgery.—Dr. Thompson, Tuesdays, at 10.30 a. m., October to April.

Medical Dispensary Service.—Dr. Leech, Tuesdays, Thursdays, and Saturdays, at 2 p. m.; Mondays, Wednesdays, and Fridays, at 2 p. m.

Surgical Dispensary Service.—Dr. McArdle, Tuesdays, Thursdays, and Saturdays.

*At the Central Dispensary and Emergency Hospital.*

Orthopedic Surgery.—Dr. Shands, Fridays, at 1 p. m. (fourth year).

Nervous Diseases.—Dr. Robins, Mondays and Thursdays, at 12 noon (fourth year).

Surgery.—Dr. W. P. Carr, daily, at 2 p. m., and Thursdays, at 5.30 p. m., October to January 15; Dr. W. B. Jackson, clinical assistant.

Genito-urinary.—Dr. Francis R. Hagner, Wednesdays, 1 to 2 p. m. (fourth year).

Dermatology.—Dr. Carmichael, Tuesdays and Fridays, 1 to 2 p. m. (third year).

*At the Lutheran Dispensary.*

Ophthalmology.—Dr. Butler, Tuesdays, at 1 p. m. (third year).

*Episcopal Eye, Ear, and Throat Hospital.*

Otology and Laryngology.—Dr. Richardson, Saturdays, at 1 p. m., November and December (fourth year).

*At Providence Hospital and at Columbia Hospital by Special Invitation.*

Gynecology.—Dr. Bovée, Mondays and Thursdays (fourth year).

*Columbia Hospital.*

Obstetrical Demonstrations.—Dr. Cabell will superintend this work at the hospital, and notify fourth-year students when cases are ready.

*At St. Elizabeth's.*

Mental Diseases.—Dr. A. B. Richardson, Saturdays, January 1 to April 1.

Clinics at the UNIVERSITY HOSPITAL will be given by members of the Faculty at hours to be named at the beginning of the course.

In addition, clinics will be given at the other hospitals of the city.

*Cards giving exact days and hours of all clinical instruction are issued at the beginning of each term.*

When the student presents himself for graduation his record must show that he has attended full courses in clinical instruction in the various branches required.

PRIZES.

GENERAL EXAMINATION PRIZE.—At the end of the year a general examination prize of fifty dollars is awarded. It is given to the candidate for graduation who shall pass the best general examination.

FACULTY PRIZE.—The Faculty awards two prizes—one for proficiency in Clinical Medicine and one for proficiency in Clinical Surgery.

YARROW PRIZE.—Professor H. C. Yarrow gives a prize for the best examination in Dermatology.

JOHNSON PRIZE.—Professor H. L. E. Johnson gives a prize for the best examination in Clinical Gynecology.

**RICHARDSON PRIZE.**—Professor Charles W. Richardson gives a prize for the best examination in Laryngology and Otology.

**TOMPKINS PRIZE.**—Professor E. L. Tompkins gives a prize for the best examination in Nervous Diseases.

**ACKER PRIZE.**—Professor Acker gives a prize for the best examination in Pædiatrics.

**BUTLER PRIZE.**—Professor Butler gives a prize for the best examination in Ophthalmology.

#### SCHOLARSHIPS.

Applications for scholarships should be filed with the Corresponding Secretary of the University not later than September fifteenth. Students holding scholarships pay the matriculation, library, laboratory, and graduation fees.

**CORCORAN SCHOLARSHIPS.**—In recognition of the liberality of the late W. W. Corcoran, the University has established in this department six free scholarships. These scholarships continue throughout the course.

Two of these scholarships are open for competitive examination to the graduates of the several High Schools of the District of Columbia. These two scholarships are awarded to the two students whose averages are highest.

Two of the scholarships are open for competitive examination to graduates of any reputable High School or College (preference being given to those in the District of Columbia) who shall give satisfactory written evidence of pecuniary inability and certificates of good moral character and industry. These two scholarships are awarded to the two graduates whose averages are highest.

The remaining two scholarships are open for competitive examination to students who, though not graduates of any High School or College, yet give satisfactory evidence that they are fitted by previous education for the study of medicine, and at the same time give satisfactory written evidence of pecuniary inability and certificates of good moral character and industry. These two scholarships are awarded to the two students whose averages are highest.

**MEDICAL MISSIONARY SCHOLARSHIPS.**—Two Medical Missionary Scholarships will be given to such applicants as are judged by the President of the University best qualified to enter upon the study of medicine for the purpose of becoming medical missionaries. These scholarships are awarded for one year only, but they may be renewed.

## COURSES IN ARTS AND SCIENCES.

Students taking a full course for a degree may be admitted without additional fee, except laboratory fees, to courses for which they are qualified, in the Department of Arts and Sciences, provided such courses do not exceed in the aggregate six periods per week.

## FEES.

1. University matriculation fee (payable but once)	\$5
2. Annual library fee	2
3. Tuition per annum	110
4. Graduation fee	10

## LABORATORY MATERIAL AND DEPOSIT FEES.

5. Anatomical laboratory per annum	\$10
6. Chemical laboratory per annum	5
7. Deposit (returnable) for breakage, chemical laboratory	5

All tuition fees are payable semi-annually in advance.

NOTE.—*Students withdrawing before the close of an academic year are required to give immediate written notice to the Registrar of the University; otherwise no deduction from the full year's fees will be made.*

## ROOMS AND BOARD.

Desirable rooms, convenient to the University buildings, and good board are obtainable at moderate prices. A list of eligible boarding-houses will, upon request, be furnished by the Registrar of the University.

## LOCATION.

The new Medical and Hospital Buildings are situated opposite a Government reservation, Nos. 1325 to 1335 H Street, N. W., within half a square of all lines of street cars going to every part of the city.

For catalogues, application blanks, and further information regarding the Department of Medicine address

CHANNING RUDD, Registrar,  
Columbian University,  
Washington, D. C.

## STUDENTS IN DEPARTMENT OF MEDICINE.

## First Year.

Name	Legal address.	City address.
Anderson, Paul	Ill.....	617 14th Street.
Ball, Howard Potts	N. Y....	The Astoria.
Barnesby, Walter Raleigh	Ill.....	The Brunswick.
Behlert, Henry	N. Y....	819 13th Street.
Biggs, Joseph Rozier	D. C....	1930 8th Street.
Bogan, Joseph Borrows	D. C....	606 Mass. Avenue.
Bower, Charles Franklin	S. Dak..	8 B Street, N. E.
Boyd, William Alexander	N. C....	1325 H Street.
Brown, Wiley Gustavus	Texas...	52½ Bates Street.
Bryson, Herbert James	Pa.....	714 12th Street, N. E.
Burket, Clare William	Pa.....	1519 Kingman Place.
Carr, William Brown, Jr.	Va.....	1418 L Street.
Carter, Paul Irving	Cal.....	1418 L Street.
Cliff, Benjamin Franklin	N. C....	1006 I Street.
Chipman, Cline N.	Ky.....	1015 L Street.
Conklin, Coursen Baxter	N. Y....	1611 13th Street.
Coster, Leonard Martin	D. C....	403 2d Street, S. E.
Dent, Wade Gilbert	Md.....	1312 12th Street.
Dunbar, Ulric S. J.	D. C....	56 V Street.
Darnall, Moses Hubbard	Texas...	1717 Riggs Place.
Emery, James Armitage	Md.....	60 The Olympia.
Farrer, Herbert Stratford	Ill....	407 2d Street, S. E.
Frazier, Frank Eugene	Wis....	Post Office Department.
Garton, Alfred Clark	Ind....	1318 12th Street.
Grant, John Lee	Va.....	19 Grant Place.
Habel, William Parker Herbst	Pa.....	2146 F Street.
Hanback, Irven Leonard	Va.....	608 F Street, S. W.
Haywood, John Kerfoot	N. Y....	Agricultural Department.
Holden, Fred A.	Mo....	Treasury Department.
Howlett, Howard Henry	D. C....	1313 Wallach Place.
Johnston, Henry Vernon	D. C....	1221 New Jersey Avenue.
Kearney, Henry Walper	Va.....	1302 L Street.
Kline, Lane Bruce	Va.....	1213 Q Street.
Knode, Thomas Edson	Minn...	1526 P Street.
Lake, Norman Powell	Va.....	1111 5th Street.
Lamkin, Joseph Bayard	Ga.....	913 New York Avenue.
Lee, Thomas Alexander, Jr.	D. C....	2211 Washington Circle.
Legg, Thomas Henry	Md.....	Bladensburg, Md.
Levy, William Victor	N. J....	8 B Street, N. E.
McLaine, Warren	D. C....	618 E Street.

*Department of Medicine.*

135

Name	Legal address.	City address.
Mata, Carlos.....	Costa Rica, 1715 Q Street.	
Mess, William Adam.....	Ind .... 75 N Street.	
Meyer, Henry Adolph.....	Pa ..... 212 8th Street, S. E.	
Miller, Robert Halsey.....	Ky..... 507 2d Street.	
Moffitt, Harry Watson.....	Ohio ... 127 B Street, S. E.	
Monk, Frederic Hinton.....	N. Y... 1211 I, Street.	
Morris, Roy Thomas .....	Ohio ... 1209 O Street.	
Nielson, Alexander J.....	Utah.... 5 Tennessee Avenue.	
Nubel, John Frederick.....	N. Y... 1202 K Street.	
Parrish, William Caldwell.....	Md..... Gaithersburg, Md.	
Rector, Frank Leslie.....	Okl. Ty. 243 Delaware Ave., N. E.	
Rock, George Roscoe.....	N. J.... 522 Seward Square, S. E.	
Royer, Jesse Herman.....	Pa. ... 1104 9th Street.	
Schapiro, Louis .....	Wis.... 726 13th Street.	
Shacklette, William Sidney.....	Va ..... U. S. Navy Yard.	
Sims, William Carter.....	La ..... 1010 B Street, N. E.	
Smith, Joseph Allen.....	N. Dak. 933 I Street.	
Smith, Paul Jones.....	Kansas. 511 10th Street.	
Smith, Thomas Francis.....	Fla.... 1400 Staughton Street.	
Stephenson, Eugene T.....	Texas .. 1382 E Street, N. E.	
Stout, Henry Isaiah.....	D. C.... 207 9th Street, S. W.	
Taylor, Edward.....	Ala.... 1013 P Street.	
Teeter, Frank Irvin.....	Mo..... 818 6th Street.	
Thomas, William Joshua Groat .....	D. C.... 905 O Street.	
Tomlin, Timothy Harrington.....	Mo. ... 1009 B Street, N. E.	
Van Vliet, Frederick Christiaan.....	N. J.... 819 15th Street.	
Walker, Emmert Delon.....	Cal..... 1010 H Street.	
Wallace, Clifton Robert.....	Va ..... 413 Mills Building.	
Waring, John Harvie.....	Va ..... 1830 Oregon Avenue.	
Warner, Harry J .....	Ill..... 1304 W Street.	
Watson, Charles Lyman.....	D. C.... 2148 F Street.	
Weithas, Richard Charles .....	N. Y... 1221 H Street.	
West, Reginald Dulaney.....	Md..... 512 13th Street.	
West, Edward Sessions.....	D. C.... Benning, D. C.	
Whamond, Fred Gordon.....	Ill..... 109 I Street.	
White, Eben Wesley .....	N. Y ... 1810 Riggs Place.	
Willets, David Gifford .....	N. J.... 2101 F Street.	
Wilson, Edward Comstock.....	N. Y... The Litchfield.	

*Second Year.*

Arntzen, Julius L.....	Mo..... 1016 15th Street.
Battles, Samuel Lee .....	La. .... 611 Morris Street, N. E.
Beale, Kenneth Foster.....	Mass... Branchville, Md.

Name	Legal address	City address
Brecht, Nelson Duvall.....	D. C....	609 22d Street.
Broughton, William Simmons.....	Ill.....	The Buckingham.
Buchanan, Clarence Henry.....	W. Va..	915 I Street.
Burnell, William Barry.....	Oregon.	1519 Kingman Place.
Catts, Samuel Rozier.....	Va.....	Washington Navy Yard, D. C.
Clements, Lyman Jairus.....	Miss....	123 6th Street, N. E.
Clifford, John Sullivan.....	N. H....	209 Star Annex.
Compton, Arthur George.....	D. C....	1121 Roanoke Street.
Currie, James Daniel.....	Texas..	314 Mass. Avenue, N. E.
Dent, Warren Levi.....	Md.....	Hyattsville, Md.
Dollman, Mazarine Clarence.....	Va.....	1000 N Street.
Edmunds, Meade Randolph.....	Miss....	1217 K Street.
Estes, Robert Montgomery.....	Ky.....	Colonial Hotel.
Evans, Edwin Gough.....	D. C....	27 8th Street, S. E.
Forsythe, James Steele.....	Miss....	18 N Street.
Goss, Ralph Montgomery.....	Ga.....	1519 Kingman Place.
Gow, James Robertson.....	Ohio...	122 D Street, N. E.
Grant, Charles Vincent.....	Pa.....	The Berkshire.
Grayson, Charles Shober.....	N. C....	920 Massachusetts Ave.
Hailman, Hubert Victor.....	D. C....	922 14th Street.
Hamilton, Kosciusko.....	Tenn....	1203 11th Street.
Hankemeyer, Nathaniel William....	Mass....	1316 Mass. Avenue, S. E.
Hardesty, William Slaughter.....	W. Va..	402 Ethelhurst Flat.
Harrison, Charles Alben.....	Ill.....	Sibley Hospital.
Hart, John White.....	Mass....	333 C Street.
Hartley, Clarence A.....	Ind.....	919 New York Avenue.
Hastings, John Emery.....	N. Y....	Colonial Hotel.
Hefebower, Roy Cleveland.....	D. C....	915 New Hampshire Ave.
Hess, Clarence Thomas.....	D. C....	8 M Street, N. E.
Hickok, Le Roy W.....	N. Y....	924 8th Street.
High, D. Lee.....	Md.....	416 M Street.
Hooe, Robert Arthur, Jr.....	Va.....	1110 New York Avenue.
Houghton, Charles Everett.....	Mass....	310 E Street.
Huber, Levi Houston.....	Pa.....	913 H Street.
Huff, Charles W. Scott.....	Minn....	Govt. Printing Office.
Jorgenson, Hans Christian.....	N. Y....	Navy Yard, Washington, D. C.
Kebler, Lyman Frederic.....	Pa.....	1343 Kenesaw Avenue.
Kilgour, Robert Mortimer.....	Mont...	Navy Department.
Kohlhaas, George N.....	Pa.....	801 12th Street.
Lanza, Anthony Joseph.....	N. Y....	1232 13th Street.
Laughlin, John Royer.....	Pa.....	1460 Corcoran Street.
Lund, Herbert Zacharias.....	Utah...	905 C Street, N. E.

*Department of Medicine.*

137

Name.	Legal address	City address.
McAfee, Larry Benjamin	Ind. ....	933 I Street.
McCollum, Hiram	N. Y. ....	2016 O Street.
McDaniels, James Madison	S. C. ....	1119 K Street
Machler, Francis Patrick	Ill. ....	1460 Corcoran Street
McLean, Frank	D. C. ....	735 13th Street.
Mebane, William Nelson	N. C. ....	1023 Vermont Avenue.
Merritt, William Allison	D. C. ....	203 8th Street, N. E.
Middleton, Carroll Sewall	Md. ....	1460 Corcoran Street.
Montgomery, Herbert Bridger	Ohio....	230 Massachusetts Ave.
Moore, Mead	Ky. ....	1307 F Street.
Nutting, Hugh	N. Y. ....	209 A Street, S. E.
Nyce, Benjamin Brooke	Md. ....	1317 Q Street.
Perry, Benjamin Cissel	Md. ....	Kensington, Md.
Phillips, Orlyn Sargent	Neb. ....	826 14th Street.
Ransom, Brayton Howard	Neb. ....	1362 B Street, S. W.
Reeves, Arthur F.	N. C. ....	1006 I Street.
Rittenour, Frederick Holiday	Va. ....	212 12th Street.
Rollins, John Lester	D. C. ....	702 F Street, N. E.
Sheiry, Dillon	D. C. ....	132 F Street, N. E.
Smith, Stephen Harrison	Va. ....	Alexandria, Va.
Smith, William Hamilton, Jr.	D. C. ....	1314 Connecticut Avenue.
Spire, Richard Lee	N. Y. ....	1120 C Street, S. E.
Stanley, Arthur Camp	Wis. ....	2330 Massachusetts Ave.
Stevenson, Earle Clement	Neb. ....	931 New York Avenue.
Sutton, Dallas Gilchrist	Pa. ....	921 19th Street.
Tallmadge, Henry Hobart	Pa. ....	2924 14th Street.
Tasker, Arthur Newman	D. C. ....	126 C Street, N. E.
Terry, Philip Roy	La. ....	1437 Kenesaw Avenue.
Towner, Frank Hough	D. C. ....	1316 7th Street.
Trent, Joseph Peterfield	Va. ....	The Luzon.
Waldecker, Franz Carl	Kansas.	2835 15th Street.
Warfield, Walter Adgate	Va. ....	Columbia Hospital.
Warman, Frank Corson	Pa. ....	3345 17th Street.
Whiteside, William Everett	W. Va. ....	325 E Street, N. E.
Williams, Arthur Harry	Vt. ....	726 17th Street.
Williams, Richard Theodore	D. C. ....	1319 8th Street.
Winter, Frank Ernest	Me. ....	U. S. Naval Hospital.
Woods, Carl Warren	Vt. ....	1224 13th Street.
Yates, Robert Jackson	Va. ....	1300 Pennsylvania Ave.

*Third Year.*

Allen, Frank A.	Minn. ....	1533 3d Street.
Ammerman, Charles Clark	N. Y. ....	911 N. C. Ave., S. E.
Austin, Samuel Duffie	Miss. ....	1015 L Street.

Name.	Legal address.	City address.
Baldwin, Herschel Edward	Ill. ....	617 19th Street.
Bennett, Robert Anderson	Pa. ....	1453 14th Street.
Brady, Zadoc Maurice	Md. ....	Anacostia, D. C.
Brown, Ernest William	Conn. ...	1715 De Sales Street.
Browne, Rhodric Winfield	Mass. ....	903 S Street.
Bryan, Henry Bohlen	Va. ....	Alexandria, Va.
Burch, Edward Warren	Md. ....	218 I Street, S. E.
Bush, Daniel P.	Neb. ....	1224 11th Street.
Camp, George Hildreth	Pa. ....	19 8th Street, N. E.
Cowan, Wayne F.	Wis. ....	900 14th Street.
Dorman, John Wesley	Ohio ....	1446 Rhode Island Ave.
Fisher, Raymond Adams	D. C. ....	505 B Street, N. E.
Foley, Thomas Madden	D. C. ....	147 Thomas Street.
French, William Joseph	Minn. ....	1133 24th Street.
Garrison, Philip Eugene	N. J. ....	2101 F Street.
Graham, Earl Bruce	N. Y. ....	620 I Street.
Gunning, Edward James	Pa. ....	Govt. Printing Office.
Haggerty, James Edward	N. Y. ....	1543 1/2 3d Street.
Harlan, Tharos	Md. ....	1229 10th Street, S. E.
Hart, Frederick Mason	N. Y. ....	Takoma Park, D. C.
Havea, Frank C	Ill. ....	1229 Princeton Street.
Henning, Samuel Carl	N. Dak. ....	900 14th Street.
Hill, Paul Stanley	Me. ....	The Westminster.
Hillegass, Ross Joseph	Pa. ....	1326 New York Avenue.
Holland, Josiah Hutton	D. C. ....	Children's Hospital.
Hovsepian, Armen Garabed	D. C. ....	Care of Moses and Sons.
Hudson, William Burrows	Conn. ....	United States Jail, D. C.
Jett, Frank Hubert	Ind. ....	Wash. Asylum Hospital
Jones, Glenn Irvine	D. C. ....	1543 9th Street.
Kemble, Adam	D. C. ....	Soldiers' Home Hospital.
Kruidenier, Albert Browne	Iowa ....	The Elsmere.
Krulich, Emil	Iowa ....	1213 H Street.
Kuehn, Frederick William	Ind. ....	1129 5th Street.
Littlepage, William Houston	Ark. ....	1335 L Street.
McConnell, James Henry	N. Y. ....	905 Florida Avenue.
Martine, Frank Leslie	N. J. ....	1115 K Street.
Meloy, Arthur Nourse	Md. ....	937 I Street.
Murphy, Joseph Alexander	D. C. ....	1103 10th Street.
Murphey, William Houston	La. ....	1008 I Street.
Newton, Elmer Slayton	D. C. ....	The Brunswick.
B. A., Amherst College.		
Norcross, Alfred Cookman	Pa. ....	819 Quincey Street.
Osborne, Edward Lee	Ga. ....	813 12th Street.
Wender, Charles Alexander	Texas. ....	1302 L Street.

*Department of Medicine.*

139

Name	Legal address.	City address.
Raison, Thomas Wrightson	Ky. . . .	The Litchfield.
Repetti, Fred	D. C. . . .	527 6th Street, S. E.
Robnett, Ausey Hamilton	Texas. . .	1015 L Street.
Ryan, Bernard	Va. . . .	1604 15th Street.
Sawyer, Edward Whitmore	Mass . . .	1544 Columbia Street.
Shea, William Edward	Idaho . . .	814 22d Street.
Smith, James Britton	Ga. . . .	413 L Street.
Stanton, Gordon	S. C. . . .	1006 Mass. Avenue.
Stiles, George Whitefield, Jr.	Okl. Ty. .	722 1/4 11th Street.
Talbott, John Allan	Md. . . .	908 15th Street.
Trow, Walter Gordon	D. C. . . .	414 Seward Square.
van Casteel, Gerald	Md. . . .	109 Maryland Ave., N. E.
LL. B., LL. M., Georgetown University.		
Waters, Charles Lewis	Md. . . .	1416 New York Avenue.
Watters, Marcus Henry	Vt. . . .	227 N. J. Avenue, S. E.
West, Richard Thomas	Md. . . .	1126 10th Street.
Wharton, John James, Jr.	Va. . . .	1413 F Street.
Whitney, Lawrence Luther	N. Y. . . .	736 3d Street.
Wilcox, Horace Leroy	Pa. . . .	2610 University Place.
Wilkinson, Walter Watkins	Va. . . .	1906 16th Street.
Willson, Prentiss	D. C. . . .	The Arkwright.

*Fourth Year.*

Alleman, Albert	D. C. . . .	705 Q Street.
A. B., Gymnasium of Soleure, Switzerland.		
Bagby, Bathurst Browne	Va. . . .	631 8th Street, N. E.
Barnhart, Grant Samuel	Pa. . . .	12 Iowa Circle.
Blye, Benjamin Franklin	N. Y. . . .	1440 V Street.
Brown, Hugh Arbuthnot	N. J. . . .	121 A Street, N. E.
A. B., Princeton University.		
Buck, John R.	Me. . . .	The Montgomery.
Butts, Heber	Mo. . . .	1321 M Street.
Carswell, Fontaine Lee	Ga. . . .	802 L Street.
Christmas, William Whitney	N. C. . . .	725 12th Street.
Clark, William Earl	D. C. . . .	1508 H Street.
Crandall, H. Noble	Pa. . . .	814 22d Street.
Cuthbertson, Charles Wesley	D. C. . . .	307 7th Street.
D. D. S., Columbian University.		
Didier, Frederick William	N. C. . . .	1512 13th Street.
Fadeley, Forrest F.	Va. . . .	2023 N Street.
Fisher, James Grant	Pa. . . .	C. U. Hospital.
Franklin, Edmund Thos. Murdaugh	Va. . . .	Alexandria, Va.
Frischkorn, Robert Walter	Pa. . . .	1014 K Street.

Name.	Legal address.	City address.
Guller, Homer Gifford	Conn. . . . .	1615 Florida Avenue.
Gorny, John L.	Ohio . . . . .	Casualty Hospital.
Gough, Thomas Reeder	Md. . . . .	1931 K Street.
Halford, Joseph W.	N. C. . . . .	1108 8th Street.
Hanson, Louis H.	Wis. . . . .	Children's Hospital.
Hanson, William Clinton	Mass. . . . .	704 10th Street.
Harley, Richard Cooke	Md. . . . .	Bureau Animal Industry.
Harrington, Francis Edward	Va. . . . .	Hotel Stratford.
Hawes, Charles Sumner	Mass. . . . .	1231 Harvard Street.
Higgins, Montgomery Earle	Md. . . . .	1012 15th Street.
Holmes, John Alvin	D. C. . . . .	1321 Kenesaw Street.
Houghton, Montafix Wilson	D. C. . . . .	2900 N Street.
Hvde, Charles Wilbur	Ohio . . . . .	1313 H Street.
Hynson, Laurence Maxwell	D. C. . . . .	623 S. C. Avenue, S. E.
Johnson, Flavius Thomas	Mich. . . . .	1442 Florida Avenue.
Jones, Samuel Augustus	Ohio . . . . .	3020 Irving Place.
Knight, Carlisle Patterson	D. C. . . . .	The Olympia.
Lewis, Archibald Cary	Va. . . . .	1931 K Street.
Linville, Thomas	N. C. . . . .	267 N Street.
Lloyd, Patrick Hamilton	Md. . . . .	Casualty Hospital.
Lynch, James Mortimer	Texas. . . . .	1016 13th Street.
Manville, William Earl	Tenn. . . . .	927 P Street.
Martyn, Herbert Everard	D. C. . . . .	232 9th Street, S. E.
May, Carroll Hackney	Va. . . . .	Alexandria, Va.
Monroe, Adolph	Md. . . . .	1223 L Street.
Montgomery, Frederick Erskine	D. C. . . . .	2209 Washington Circle.
Murray, Arthur Lapham	N. Y. . . . .	254 Delaware Ave., N. E.
Neill, Luther Clarence	Tenn. . . . .	The Llewellyn.
Olsen, Egil Thorbjorn	Ill. . . . .	3 B Street, S. E.
Oswell, Charles Arthur	N. Y. . . . .	1864 Wyoming Avenue.
Patten, William Francis	N. Dak. . . . .	1756 M Street.
Perry, Custis Russell	Va. . . . .	610 21st Street.
Peterson, George	Md. . . . .	729 13th Street.
Powell, Llewellyn	Va. . . . .	University Hospital.
Prosperi, Milton Hickox	D. C. . . . .	501 8th Street, S. E.
Pyles, John Chester	Md. . . . .	1219 I Street.
Reger, Harry Sebastian	Ohio . . . . .	1318 12th Street.
Ruedy, Robert Conrad	Va. . . . .	Garfield Memorial Hosp.
Saffold, Guy Stark	Md. . . . .	The Victoria.
Schulze, William	La. . . . .	316 C Street.
Seitz, Roy Ernest	Ill. . . . .	1012 15th Street.
Sells, George James	Tenn. . . . .	1324 I Street.
Smith, Harry Washington	Pa. . . . .	The Brunswick.
Smith, Lucian Conway	Va. . . . .	Alexandria, Va.

# *Department of Medicine.*

141

Name.	Legal address.	City address.
Sutton, Richard Lightburn.....	Mo.....	U. S. Naval Med. School.
Swain, Benjamin Hallowell.....	N. C.....	1209 Q Street.
Syme, William Henry.....	Va.....	2106 18th Street.
Thompson, Joseph Lawu.....	Md.....	Rockville, Md.
Yates, Frederick.....	D. C.....	Columbian Univ. Hospital.
Young, William Glenn.....	Tenn.....	The Montgomery.

## *Review Students.*

Nyman, Carl Victor .....	Ill.....	University Hospital.
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## *Special Students.*

Dewey, Christian Henry .....	Ill.....	37 Bates Street.
Fischer, Guillermo Gustavo.....	Cuba...	1534 I Street.
Green, William Alexander.....	N. C.....	1327 Roanoke Street.
Hooe, A. Barnes.....	D. C.....	1110 New York Avenue
M. D., Columbian University.		
Kurtz, John, M. D.....	D. C.....	3142 P Street.
May, Henry Agitt, M. D.....	Md.....	Chevy Chase, Md.
Saxon, Gordon Joel.....	D. C.....	1502 20th Street.
Trent, George Andrew, M. D.....	Va.....	19 Grant Place.
Wilkinson, Oscar, M. D.....	Miss.....	1404 L Street.
Zinke, Stanley Gustav, M. D.....	Ohio...	1702 Q Street.

## *Recapitulation.*

First Year Students.....	78
Second Year Students.....	84
Third Year Students.....	66
Fourth Year Students.....	67
Review Students.....	1
Special Students.....	10
Total.....	306

## **Ordinance**

### **Providing for the Organization and Conduct of a Department of Public Health.**

The Board of Trustees of the University on February 20, 1904, adopted an ordinance for the organization and conduct of a new department, "for the purpose of graduate education in the subjects of preventive medicine and the fundamental and administrative laws pertaining to the prevention of disease, epidemics and injuries, which shall be designated as the Department of Public Health."

The courses of study in the new department will be arranged so as to give students a one-year course of resident instruction in the University, with satisfactory examinations, leading to the degree of Master of Public Health, and a two-year course in residence, leading to the degree of Doctor of Public Health, provided the candidate for the doctor's degree, in addition to passing satisfactory examinations on the studies pursued, shall present to the faculty a thesis, together with a satisfactory bibliography, exhibiting independent research, upon a subject approved by the faculty.

This ordinance will go into effect when pledges for a sufficient endowment have been secured.

## Department of Dentistry.

### THE FACULTY.

- CHARLES W. NEEDHAM, LL. D.,  
President of the University.
- J. HALL LEWIS, D. D. S., Dean.  
Professor of Dental Prosthetics.
- HENRY C. THOMPSON, D. D. S.,  
Professor of Operative Dentistry.
- D. KERFOOT SHUTE, M. D.,  
Professor of Anatomy.
- \* EMIL A. DE SCHWEINITZ, M. D.,  
Professor of Chemistry.
- WILLIAM P. CARR, M. D.,  
Professor of Physiology.
- THOMAS A. CLAYTOR, M. D.,  
Professor of Materia Medica and Therapeutics.
- JONATHAN R. HAGAN, D. D. S.,  
Professor of Oral Surgery.
- W. F. R. PHILLIPS, M. D.,  
Demonstrator of Anatomy.
- JOHN B. NICHOLS, M. D.,  
Professor of Normal Histology.
- JAMES CARROLL, M. D.,  
Professor of Pathology and Bacteriology.
- WILLIAM H. TRAIL, D. D. S.,  
R. E. L. HACKNEY, D. D. S.,  
JOHN R. DE FARGES, D. D. S.,  
CÆSARE LOUIS CONSTANTINI, D. D. S.,  
Demonstrators in Charge of Infirmary.
- CHANNING RUDD, D. C. L.,  
Registrar of the University.

\* Died February 15, 1904.

### NEW BUILDING.

The new building of the Department of Dentistry is now completed and occupied. This building is 50 feet by 144 feet, five stories in height, of fire-proof construction, and with every facility for the instruction and comfort of the students. There are four large lecture halls, with modern heating and ventilating appliances. The laboratories for Chemistry, Histology, Physiology, Bacteriology, Pathology, and Anatomy are models of their kind, while the operative and prosthetic technic laboratories are thoroughly equipped for technic instruction.

The Dental Infirmary is 50 feet by 75 feet, on the third floor: in order to have an unobstructed light, it has large windows on three sides; there are adjoining prosthetic laboratories, separate lavatories for students and patients, and lockers sufficiently high to accommodate a dental engine. In fact, everything is provided to insure the comfort and convenience of all who occupy or visit this portion of the building.

Two courses of lecture, laboratory, and clinical work will be given during the year, the one beginning daily at 9.30 a. m., the other at 4.50 p. m. These are similar in every respect, with the same requirements for admission and graduation, and with the same instruction and the same instructors. The student may select either course or attend both without extra charge, within certain limitations.

### ADMISSION.

The minimum preliminary educational requirement of this Department is a certificate of entrance into the third year of a high school or its equivalent. The preliminary examination will be placed in the hands of the State Superintendent of Public Instruction.

### ADVANCED STANDING.

The following is considered as equivalent to one course in this Department: A diploma from a recognized medical school, or satisfactory evidence that the student has passed the first-year examination in some other reputable dental school.

The following is considered as equivalent to two courses in this Department: A diploma from a reputable dental school, or evidence of having passed the second-year examination in such a school.

## COURSES OF INSTRUCTION.

The Regular Course of Lectures begins on Thursday, September 29, 1904, and continues eight months.

The Introductory Lecture of the Course will be delivered by Dr. J. Hall Lewis on the above date.

The courses of instruction extend through four years.

As no amount of scientific attainment can compensate for lack of manipulative skill, a large part of the student's time is devoted to actual practice in the Infirmary. The large and centrally located Dental building gives ample opportunities for such practice.

The operating-room fronts on one of the Government reservations, and thus has the full, unobstructed light so desirable in dental operations. It is furnished with all necessary appliances that will enable a student to acquire the knowledge of office practice, as well as a diversity of clinical experience.

A large, comfortable, and well-lighted Dental Laboratory is supplied with all the requirements for the successful practice of Prosthetic Dentistry, and lockers are available for the safe-keeping of instruments belonging to the students.

The extracting room is separate from the others, and is fitted up for the proper administration of the various anæsthetics, under the immediate supervision of a demonstrator thoroughly skilled in their application.

Special attention is called to the thoroughness of the practical instruction in the infirmary, which is under the immediate supervision of Professor Lewis and Drs. Trail and Hackney, the Demonstrators in charge. They are in constant attendance during the entire term, directing and overseeing the operations of the students, who thus have the benefit of their many years of experience in Dental Practice.

The Infirmary is open every week day for nine continuous months (being closed during the months of July, August, and September), during which time an abundance of clinical material is readily available. In fact, as many patients present themselves as can possibly be attended to by the students.

The student has, therefore, the privilege of thirty-six months' actual practice in the infirmary, during which time he may become proficient in all those operations which the dental surgeon is ordinarily called upon to perform in office practice.

This Department complies with all the requirements of the National Association of Dental Faculties and also with those of the National Association of Dental Examiners, in so far as

the requirements of the latter do not conflict with those of the former.

#### PROSTHETIC DENTISTRY AND METALLURGY.

Professor LEWIS.

In this department the principles involved in the construction of artificial substitutes are exhaustively considered, and the lectures supplemented by practical demonstrations of the subjects mentioned.

In addition to the more commonly used vegetable bases for artificial teeth, the use of gold, silver, and platinum is thoroughly taught, and bridge work, and the construction of appliances for correcting oral irregularities, etc., are carefully considered.

The modes of preparation, properties, etc., of the metals and alloys of particular interest to the dentist receive special attention.

The instruction is thoroughly practical, with the purpose of preparing the student for the actual every-day practice of prosthetic dentistry.

#### OPERATIVE DENTISTRY, DENTAL ANATOMY, AND PATHOLOGY.

Professor THOMPSON.

This course embraces lectures on the special anatomy and physiology of the teeth. The origin, growth, and eruption of the teeth receive minute attention, and are illustrated as their importance demands.

The methods of treating, filling, and extracting teeth receive attention in the lecture-room, and are demonstrated clinically by gentlemen whose reputations are fully established as proficient operators. Extended consideration is given to Dental Pathology and Therapeutics.

#### CHEMISTRY.

*The vacancy caused by the death of Professor de Schweinitz will be filled and announcements made in a later bulletin.*

The instruction in this department embraces:

A short discussion of the principles of Physics in their relation to Chemistry, the principles of chemical philosophy, and the laws of chemical combination.

A study of the elements, metallic and non-metallic ; the preparation, properties, and reaction of their different compounds and their application in dentistry.

Organic Chemistry, with special attention to those organic compounds that are of practical use.

Laboratory instruction in the determination of acids and bases, analyses of alloys, etc.

### PHYSIOLOGY.

Professor CARR.

The subject is fully covered by a two-years' course of lectures, and these lectures are so illustrated by modern diagrams, models, and experiments as to make them clear in every detail. Emphasis is given to those truths that have a known practical value.

### MATERIA MEDICA AND THERAPEUTICS.

Professor CLAYTOR.

Instruction in this department extends through the first two years, and embraces :

The study of crude drugs and their preparations, and the art of prescribing.

The physiological action of drugs in the human system.

The practical application of drugs and other therapeutical agencies to the prevention and cure of diseases and the relief of suffering, together with their antidotal relations to poisons.

The subject is taught by means of lectures, recitations, and blackboard illustrations, and is made practical to as great a degree as is compatible with a sufficiently thorough understanding of its principles.

In connection with this chair is a pharmaceutical laboratory, well equipped with modern appliances, in which are taught the making of typical preparations of the Pharmacopœia, prescription writing, and the compounding of prescriptions.

### ANATOMY.

Professor SHUTR.

The instruction in Anatomy is given in a graded course of lectures, recitations from prescribed text-books, and especially by practical work in the dissection of the cadaver.

The lectures are illustrated by the use of dry and wet dissections of the cadaver, by models, diagrams, charts, and sciop-ticon views.

*Practical Anatomy.*

Practical work in osteology and in dissection are of fundamental importance. For the study of these subjects the students are divided into sections in order to make the instruction as practical and immediate as possible.

The bones of the skeleton are placed in each student's hands, and he is instructed and quizzed upon all their important features.

Laboratory instruction is under the direction of the Professor of Anatomy and his associates.

ORAL SURGERY.

Professor HAGAN.

A full course of lectures upon this subject is given, and arrangements have been made for clinical demonstrations in the Infirmary, in order to teach more thoroughly this interesting branch of general dentistry.

HISTOLOGY.

Professor NICHOLS.

The course in Histology consists in a systematic presentation of the subject of the minute anatomy of the various parts of the body, especial attention being devoted to the histology of the teeth and neighboring structures. The subject is presented partly by systematic lectures, and more especially by the practical study by the individual students of actual specimens under the microscope. The methods of preparation of microscopical specimens are presented and practiced in the laboratory. The projection microscope, which affords valuable aid in illustrating and presenting the subject, is constantly used.

BACTERIOLOGY.

Professor CARROLL.

The course is begun with a consideration of the principles involved in the process of sterilization by dry and moist heat,

the relative value and mode of application of each, and an explanation of the construction of the apparatus employed for the purpose. The use and construction of the thermostat is taken up at the same time and the student taught how he can dispense with these costly appliances in emergencies.

The composition and modes of preparation of the various nutritive media are next considered, working formulas given, and the students required to prepare them at least once in the laboratory. This is followed by a discussion of bacteria as a class, their position in the biological world, their classification, distribution, and the general and special characters that belong to them.

After this preparatory training the various methods in use for the isolation and study of bacteria are taught by practical demonstration and practiced by the students, after which the most important pyrogenic organisms are studied in detail, giving special attention to those found in the nasal and oral cavities.

The aim of the course is chiefly to afford the students an opportunity to become practically familiar with bacteriological working methods, and to enable them to isolate and identify the bacteria present in suppurative processes, as well as to comprehend intelligently the references to micro-organisms in the current professional literature of the day.

### TEXT-BOOKS AND WORKS OF REFERENCE.

(The works first named and in *italics* are preferred.)

**Anatomy.**—*Cunningham's Text-Book of Anatomy*; *Cunningham's Manual of Practical Anatomy*; *Treves's Applied Anatomy*; Wiedersheim's *Structure of Man*.

**Physiology.**—Kirke's; Stewart's *Manual*; Yeo's, or Landois & Sterling's *Physiology*.

**Chemistry.**—*Richter's*, Remsen's, *Simon's*, or Fowne's *Chemistry*; Bowman's *Medical Chemistry*; Witthaus' *Chemistry*; Purdy's *Uranalysis*; Remsen's *Organic Chemistry*.

**Materia Medica.**—*H. C. Wood's Therapeutics*; Hare's *Practical Therapeutics*; Culbreth's *Materia Medica and Pharmacy*; National Dispensatory.

**Prosthetic Dentistry.**—*The American Text-Book of Prosthetic Dentistry*; Essig's *Dental Metallurgy*.

**Operative Dentistry.**—*Harris' Principles of Practice*; Tome's *Dental Anatomy and Surgery*; Taft's *Operative Dentistry*; American System of Dentistry—Litch; Gould's *Medical Dictionary*.

**Oral Surgery.**—Marshall's *Oral Surgery*.

### GRADUATION.

Candidates for graduation must have attended four full courses of lectures, each of eight months' duration, and four courses of Clinical Instruction in this Department, during the regular winter term and in separate years, with the exceptions noted below. Students are examined at the end of the regular course upon all subjects taught them during that course. Students may go up for examination only in the spring and upon the dates regularly selected for that purpose. Should the student fail in his examination in the spring, he may be reexamined in the fall. All fees must be paid and Infirmary requirements complied with before the student may present himself for examination.

Students must enter before, or within ten days after, the opening lecture of the regular winter course. They may register at any time during the nine months' Infirmary course, and thus begin Infirmary practice at once upon payment of twenty-five dollars, which amount will be deducted from their tuition fees for the succeeding regular term.

The candidate for graduation must be examined upon all subjects taught in this Department, with exceptions noted above, and before the examination he must perform operations upon the natural organs in the Infirmary, and present the Museum a well constructed specimen of dental mechanism made by himself in the Dental Laboratory of the University.

In addition to the above requirements, the moral character and habits of the candidate, his industry, and diligent attendance will be taken into consideration. Notable negligence, immorality, or habitual absence from the lectures will preclude the candidate from attaining his degree, even though he may have acquired sufficient technical knowledge to pass a creditable examination. This reservation on the part of the Faculty of the right to make good moral character a prerequisite for graduation must not be overlooked.

The student also, during and between the sessions, must comply with the State laws regulating the practice of Dentistry, and act in accordance with the recognized code of ethics of the dental profession.

Candidates for graduation in this Department who desire to obtain a medical degree thereafter may be admitted to the medical examination on the primary branches at the termination of their second dental course, provided that, one month before the spring examinations, they give to the Dean written notice of

their intention, and provided also that they have complied with the requirements of the Department of Medicine as regards Dissection, the study of Histology, etc.

The degrees are conferred by Columbian University, incorporated by act of Congress of the United States.

### PRIZES.

**FACULTY PRIZE.**—A prize will be given by the Faculty to the graduate passing the best examination in all branches and having the best Infirmary record.

### COURSES IN ARTS AND SCIENCES.

Students taking a full course for a degree may be admitted without additional fee, except laboratory fees, to courses for which they are qualified, in the Department of Arts and Sciences, the aggregate of such courses not to exceed six periods per week.

### FEES.

1. University matriculation fee (payable but once) . . . . . \$5
2. Annual library fee . . . . . 2
3. Tuition per annum . . . . . 110
4. Graduation fee . . . . . 10

### LABORATORY MATERIAL AND DEPOSIT FEES.

5. Anatomical laboratory per annum . . . . . \$10
6. Chemical laboratory per annum . . . . . 5
7. Deposit for breakage, Chemical laboratory . . . . . 5

Laboratory fees are charged only for the years in which the work is taken.

Each student must furnish his own books and dental instruments.

All tuition fees are payable semi-annually in advance.

**NOTE.**—*Students withdrawing before the close of an academic year are required to give immediate written notice to the Registrar of the University, otherwise no deduction from the full year's fees will be made.*

## ROOMS AND BOARD.

Desirable rooms, convenient to the University buildings, and good board are obtainable at moderate prices. A list of eligible boarding-houses will, upon request, be furnished by the Registrar of the University.

## LOCATION.

The new Dental and Medical Building is situated opposite a Government reservation, at No. 1325 H Street, N. W. The University Hospital Buildings, 1333 and 1335 H Street, N. W., are within half a square of all lines of street cars going to every part of the city.

The Dean may be seen personally at 1023 Vermont avenue, on any week day, from 3 to 4 p. m., and also at the Dental Building, 1325 H Street, N. W., on Monday, Wednesday, and Friday of each week, at 4 p. m.

For catalogues, application blanks, and general information regarding the Department of Dentistry address

CHANNING RUDD, *Registrar,*  
Columbia University,  
Washington, D. C.

## STUDENTS IN DEPARTMENT OF DENTISTRY.

*First Year.*

Name.	Legal address.	City address.
Beach, John Edgar.....	Ky.....	308 East Capitol Street.
Brittin, Roy Clay.....	Tenn...	Post Office Department.
Clinton, Ralph Stuart.....	N. Y...	2138 G Street.
Davidson, Albert Sidney.....	Va.....	120 4th Street, S. E.
Edwards, Keith Wiman.....	Conn...	6 Iowa Circle.
Gordon, Oscar Harry.....	Ga ....	210 North Capitol Street.
Harrison, Marion Edwyn.....	Ga. ....	1106 L Street.
Lambert, Robert Boyd.....	S. Dak..	735 13th Street.
Lynch, Charles Patrick.....	N. Y...	627 N. C. Avenue, S. E.
Pflug, Charles Sebastian.....	Utah...	1903 G Street.
Power, Robert Walter.....	S. C....	34 B Street, N. E.

Name.	Legal address.	City address.
Smith, Joseph Lees.....	Pa ....	1208 East Capitol Street.
Taylor, John Winslow.....	Md.....	112 4th Street, N. E.
Vandewall, Ralph I.....	Wis....	Post Office Department.
Williams, Roger.....	Md.....	800 12th Street.
Woodruff, William Henry.....	N. Y...	1007 L Street.

*Second Year.*

Ake, Adolphus Blair.....	Pa.....	809 New Jersey Avenue.
Ake, Charles De Warren.....	Pa.....	809 New Jersey Avenue.
Bartlett, Lewis Miller.....	Mass...	2337 18th Street.
Bassford, Adelbert Maurice.....	Ill.....	356 War Department.
Brinton, John Milton.....	Pa.....	905 K Street.
Bullis, Mark Carleton.....	Mich...	1744 G Street.
Butler, William Earle.....	W. Va..	720 19th Street.
Carroll, Walton Cudmore.....	Md.....	1227 15th Street.
Catts, George Samuel .....	D. C....	1004 New Hampshire Ave.
Cole, Seth Eugene .....	Vt.....	700 H Street, N. E.
Correll, Ralph S. ....	Ohio ...	1121 10th Street.
Cortes, Angel Custodio .....	Porto Rico,	908 L Street.
Daniels, Robert Henry .....	Ala.....	935 K Street.
Darling, Austin R.....	N. Y...	105 E Street, S. E.
De Mass, Ralph Webster .....	Mich...	1202 North Capitol Street.
Duncan, John Kennedy. ....	Iowa ...	1232 C Street, N. E.
Fletcher, George Andrew .....	N. Y...	801 12th Street.
Francis, William Edwin.....	D. C....	708 A Street, N. E.
Handy, Joseph William.....	Mo.....	810 11th Street.
Howser, Upton Shipley. ....	Md.....	1506 6th Street.
Jaffe, Saul.....	D. C....	803 A Street, S. E.
Kuehn, Otto .....	Ind.....	1129 5th Street.
Love, Samuel Edgar.....	Minn...	1309 Corcoran Street.
Lowe, Robert Wellington.....	Mass...	1015 L Street.
Maphis, Fred De Witt .....	Va.....	Central National Bank.
Mitchell, Fred Arthur.....	Texas ..	1425 Duncan Street, N. E.
Murphy, Don Francis.....	D. C....	911 T Street.
Murray, Fred Grant.....	D. C....	211 6th Street, N. E.
Noble, Charles Brown.....	D. C....	2016 15th Street.
O'Brien, William Patrick.....	Conn...	809 New Jersey Avenue.
Orrison, Lloyd Foster .....	Va.....	1627 Q Street.
Pollock, Joseph W .....	Ind.....	413 G Street.
Rogers, Walter Edwin.....	Texas ..	813 12th Street.
Rose, Gustavus Wesley .....	Mich...	1006 M Street.
Schumacher, John Charles Robert..	Mo.....	1013 L Street.
Sproul, Robert L.....	Ohio ...	735 13th Street.

## Third Year.

Name.	Legal address.	City address.
Bassett, Charles Turk.....	N. Y....	1015 L Street.
Beatty, Albert James Tait.....	Del....	744 9th Street.
Belford, Edward Elwell.....	Ohio....	1327 10th Street.
Berry, Vivian.....	Va....	1325 H Street.
Bové, Charles Lucien.....	D. C....	1404 H Street.
Chunn, Thomas Maslin.....	N. C....	207 6th Street, N. E.
Cooksey, Claude Bonifant.....	D. C....	225 12th Street, S. W.
Cuvillier, Louis Marshall.....	D. C....	20 K Street.
Elzey, William James.....	Md....	818 6th Street.
Fluckey, James Arthur.....	Ill....	42 Bates Street.
Glenn, Louis Samuel.....	N. Y....	1212 L Street.
Harriss, Corbin.....	Md....	Rockville, Md.
Humeston, C. Andrew.....	Conn....	620 I Street.
Keech, Thomas Attaway.....	N. C....	217 5th Street, S. E.
McMichael, John Wesley.....	Mass....	208 D Street.
Madert, Benjamin Jacob.....	D. C....	1322 Kenyon Street.
Madert, John.....	D. C....	1322 Kenyon Street.
Marschalk, Leighton Van Buren....	Ky....	1252 Maryland Ave., N. E.
Marschalk, William Armstrong, Jr..	Fla....	605 8th Street, N. E.
Miller, Archie Louis.....	D. C....	Takoma Park, D. C.
Moore, Herbert Ashton.....	W. Va....	1016 15th Street.
Neely, Frank Elton.....	Ind....	216½ Q Street.
Pack, Julien.....	Pa....	431 10th Street.
Perry, Frederick Charles.....	D. C....	2128 L Street.
Potter, Vergne Waldo.....	Wis....	1753 Pennsylvania Ave.
Prendergast, James Thomas.....	W. Va....	616 3d Street.
Rozzelle, Clement Dowd.....	N. C....	207 8th Street, N. E.
Trivett, Arthur Millard.....	N. C....	1238 G Street, N. E.
Watt, Chillion Luverne.....	Mich....	420½ Warner Street.
Wilkerson, Thomas Roland.....	Va....	428 M Street.
Willson, Barrett Prettyman.....	Md....	Rockville, Md.
Wood, Joseph Henry.....	D. C....	1133 6th Street, S. W.

## Recapitulation.

First Year Students.....	16
Second Year Students.....	36
Third Year Students.....	32
Total.....	84

## Department of Law.

### THE FACULTY.

- CHARLES W. NEEDHAM, LL. D., President of the University,  
Professor of Trusts and Trades Unions.
- HENRY ST. GEORGE TUCKER, LL. D., Dean,  
Professor of Equity Jurisprudence and Comparative Constitutional Law.
- HON. JOHN M. HARLAN, LL. D., (Associate Justice of the Supreme Court of the United States),  
Professor of Constitutional Law, Domestic Relations, Torts, and Personal Property.
- HON. DAVID J. BREWER, LL. D., (Associate Justice of the Supreme Court of the United States),  
Professor of International Public Law.
- HON. WILLIAM A. MAURY, LL. D., (Member of the Spanish Treaty Claims Commission, Some time Assistant Attorney General of the United States),  
Professor of Federal Procedure, and Insurance.
- WILLIAM G. JOHNSON, LL. M., (Of the Washington Bar),  
Professor of Common Law Pleading and Practice.
- MELVILLE CHURCH, LL. M., (Of the Washington Bar),  
Professor of the Law of Patents.
- HON. STANTON J. PEELLE, LL. D. (Judge of the United States Court of Claims),  
Professor of the Law of Partnership, Agency, and Bailments.
- WALTER C. CLEPHANE, LL. M., (Of the Washington Bar),  
Professor of Equity Pleading and Practice, Organization of Corporations, and Judge of the Moot Court.
- EDWIN C. BRANDENBURG, LL. M., (Of the Washington Bar),  
Professor of Bankruptcy and Insolvency.
- ARTHUR PETER, LL. M., (Of the Washington Bar),  
Professor of Evidence, Wills and Administration, and Judge of the Moot Court.
- CHANNING RUDD, D. C. L., (Of the Washington Bar),  
Professor of Commercial Paper, the Sources, Classification, and Elements of Law, and of Oratory.

- HENRY P. BLAIR, LL. M., (Of the Washington Bar),  
Assistant Professor of the Law of Torts, Personal Property,  
and Domestic Relations.
- JOHN PAUL EARNEST, A. M., LL. M., (Of the Washington Bar),  
Professor of Criminal Law, Criminal Procedure, and Judge  
of the Moot Court.
- WILLIAM REYNOLDS VANCE, A. M., Ph. D., LL. B.,  
Professor of Real Property and Contracts.
- ROBERT M. HUGHES, A. M., (Of the Norfolk, Va., Bar),  
Professor of Admiralty Law and Procedure.
- HON. HANNIS TAYLOR, LL. D., (Formerly Minister to Spain),  
Professor of the History of English Law and Conflict of  
Laws.
- HON. FREDERICK I. ALLEN, (Commissioner of Patents),  
Lecturer on Substantive Patent Law.
- CHARLES C. SWISHER, Ph. D.,  
Professor of Comparative Politics.
- CHANNING RUDD, D. C. L.,  
Registrar of the University.

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COURT OF APPEALS.

- WILLIAM F. MATTINGLY, LL. D.,  
Chief Justice.
- ANDREW B. DUVAL, LL. B.,  
JOHN B. LARNER, LL. B.,  
Associate Justices.
- 
- WILLIAM REYNOLDS VANCE, A. M., Ph. D., LL. B.,  
Librarian of the Law Library.
- EDGAR BUXTON,  
Assistant Librarian.
- ELMER L. MOULDEN,  
Assistant Librarian.
- JOHN WILMER LATIMER, LL. B.,  
Clerk of the Moot Court.

This Department was established in 1865, and it is the oldest school of law in Washington. Men occupying the highest positions in the profession are in its faculty, personal contact with whom is a source of inspiration to every student.

At the June meeting, 1903, the Board of Trustees of the University, feeling the necessity of having some permanent professors in this Department who will devote their whole time to the work in order more effectually to carry out the broad scheme of legal education as laid down by them, elected to the Deanship of the Departments of Law, Jurisprudence and Diplomacy Henry St. George Tucker, LL. D., of Virginia. Mr. Tucker was for five years Professor of Constitutional Law and Equity in Washington and Lee University, and for several years the Dean of the Law School of that institution. He will teach the subjects of Equity Jurisprudence and Comparative Constitutional Law.

At the same meeting of the Board, Professor William Reynolds Vance, A. M., Ph. D., LL. B., the Dean of the Law School of Washington and Lee University, was elected Professor of Law, and will teach the subjects of Real Property and Contracts. Professor Vance has for six years been Professor of Law, and has been most successful in teaching the subjects assigned him.

Other permanent professors will be elected in the future. With these additions it is believed that these schools at the National Capital will be without a rival.

#### LAW LECTURE HALL.

Law Lecture Hall is devoted exclusively to the Departments of Law, Jurisprudence and Diplomacy. It adjoins University Hall, corner Fifteenth and H streets, two blocks from the White House. This new building contains three commodious lecture halls, three moot-court rooms, a large and well lighted library-room, and administrative offices. The building is lighted by electricity, handsomely furnished, and well equipped and adapted to the work for which it is designed.

#### ADMISSION.

Applicants for admission to the First-Year class as candidates for a degree must be at least eighteen years of age, and must have had an education equivalent to a high school course.

The educational requirement may be satisfied by a presentation of certificates or by an examination before the Dean. Application blanks will be furnished by the Registrar of the University.

The regular course of study embraces three years. There is also a special course of one year in Patent Law.

A student may be admitted to advanced standing upon furnishing evidence satisfactory to the Dean that he has spent not less than three months' time, and regularly pursued courses of study in a recognized law school or in a law office under the direction of a practicing attorney in good standing; and in all such cases he shall file a certificate of the facts, and if such certificate be from a law school he may receive credit for the time he has attended such school and for the studies in which he has passed successful examinations. If the certificate be from a practicing attorney, the student may receive a reasonable credit for time, but shall take examinations in all the studies pursued and for which he asks credit.

The annual session begins on the Monday nearest the first day of October and continues until the Wednesday nearest the first day of June following.

The lectures will be delivered between the hours of 4.50 and 6.30 in the afternoon.

During the session of 1903-'04 work in the morning hours was given to students of the first-year class in Contracts, Torts, Commercial Paper, Personal Property, Domestic Relations, and in the Sources, Classification, and Elements of Law. This work will be much extended during the session beginning October, 1904, so as to include some of the subjects assigned to the second-year class, as well as additional first-year courses. The work done in these forenoon conferences is collateral to the lecture courses given in the afternoon and supplemental to them. It consists in the critical examination of cases and the study of details which cannot be considered in the afternoon lectures for lack of time, and in the free discussion of the legal principles applicable. Attendance upon these morning sessions is optional, and the work assigned in connection with them is not necessary to graduation, but it will be found of great value to the student, and will contribute largely to his success in passing the regular examinations.

The register will be opened for the enrollment of students on the first day of September.

The University, in October, 1898, increased the regular course of study for candidates for the degree of Bachelor of Laws to three years. The work has been largely increased with a view of giving students that thorough knowledge of the general rules of law and practice which will fit them for the Bar of any State. Professors will conduct the study of each subject by lectures, required courses of reading, the study of cases, and

class conferences. The study of special cases upon the various subjects treated and the Moot-Court work have been largely increased, thus bringing before the student the modern applications of law by the courts of the country.

Special instruction and practical work are given the students in the preparation of Contracts and Wills, and in the organization of Corporations. This work is carefully examined and returned to the student, with suggestions by the instructors in charge of the work.

There will be ten hours per week of required class-room work in each year of the course. The optional morning work is in addition to the ten hours.

## COURSES OF INSTRUCTION.

### FIRST YEAR.

#### *First Semester.*

Sources, Classification, and Elements of Law. Professor RUDD. Lectures and Conferences. One hour.

History of English Law. Professor TAYLOR. Two hours. *Taylor's Origin and Growth of the English Constitution.*

Constitutional Law. Lectures. Professor HARLAN. Two hours.

Constitutional Law. Cases. Professor TUCKER. One hour.

Criminal Law. Professor EARNEST. Lectures and Conferences. Two hours. *Clark's Criminal Law and selected cases.*

Agency and Bailments. Professor PEELLE. Lectures and Conferences. Two hours. *Huffcutt on Agency and Hale on Bailments.*

#### *Second Semester.*

Contracts. Professor VANCE. Lectures and Conferences. Four hours. *Clark on Contracts and Hopkins' Cases on Contracts.*

Torts. Professor HARLAN. One hour. *Pollock on Torts and special cases.*

Commercial Paper. Professor RUDD. Lectures and Conferences. Two hours. *Norton on Bills and Notes (third edition) and special cases.*

Personal Property. Professor HARLAN. One hour for two months. *Smith on Personal Property and special cases.*

Domestic Relations. Professor HARLAN. One hour for two months. *Brown on Domestic Relations and special cases.*

Class Conference—Torts, Domestic Relations, and Personal Property. Assistant Professor BLAIR. Two hours.

#### OPTIONAL MORNING CONFERENCES.

##### *First Year.*

Held from 9 a. m. to 11 a. m.

Contracts. One hour, one year. Professor VANCE.

Torts, Personal Property, and Domestic Relations. One hour, one year. Assistant Professor BLAIR.

Sources, Classification, and Elements of Law. One hour, one-half year. Professor RUDD.

Commercial Paper. One hour, one-half year. Professor RUDD.

Agency and Bailments. One hour, one-half year. Professor VANCE.

History of American Politics. One hour, one year. Professor SWISHER.

First year examinations will be held at the conclusion of each course in the following subjects: Sources, Classification, and Elements Law; History of English Law; Constitutional Law; Criminal Law; Agency; Bailments; Contracts; Torts; Commercial Paper; Personal Property, and Domestic Relations. The required courses upon which examinations will be held will be given from 4.30 until 6.30 in the afternoon.

First year instruction will be carried on by topical lectures, supplemented by carefully arranged courses of reading and the study of selected cases which state and illustrate the law. There will be class conferences upon the lectures, and free questioning by students is encouraged. Quiz classes may be formed, and every facility will be afforded the student to aid him in a thorough understanding of the subjects studied.

#### SECOND YEAR.

##### *First Semester.*

Contracts. Professor VANCE. Lectures and Conferences. Three hours. *Special phases of contract law, with illustrative cases.*

Private Corporations. Professor ———.\* Lectures and Conferences. Two hours. *Clark and Dillon*.

Municipal Corporations. Professor ———.\* Lectures and Conferences. One hour.

Equity Jurisprudence. Professor TUCKER. Lectures and Conferences. Two hours. *Bispham*.

Partnership. Professor PEELER. Lectures and Conferences. One hour. *Burdick on Partnership*.

Insurance (Fire, Life, and Marine). Professor MAURY. Lectures and Conferences. One hour. *Wambaugh's Cases on Insurance*.

*Second Semester*

Real Property. Professor VANCE. Lectures and Conferences. Four hours. *Book II of Blackstone, special cases, and notes*.

Evidence. Professor PETER. Lectures and Conferences. Four hours. *Greenleaf on Evidence, and special cases*.

Common Law Pleading and Practice. Professor JOHNSON. Lectures and Conferences. Two hours. *Stephen on Pleading (Tyler) and Cox's Common Law Practice*.

OPTIONAL MORNING CONFERENCES.

*Second Year.*

Held from 9 a. m. to 11 a. m.

Evidence. One hour, one year. Professor PETER.

Real Property. One hour, one year. Professor VANCE.

Equity. One hour, one year. Professor TUCKER.

Corporations. One hour, one year. Professor ———.\*

Partnership. One hour, one-half year. Professor VANCE.

Second year examinations will be held at the conclusion of each course in the following subjects: Contracts; Private Corporations; Municipal Corporations; Equity Jurisprudence; Partnership; Insurance; Real Property; Evidence; and Common Law Pleading and Practice.

Special courses of reading in text-books and selected cases will be assigned by the professors, and cases will be used in the lectures to illustrate the subject under consideration.

\*To be appointed before October, 1904.

Practical work in the preparation of contracts and written obligations of various kinds will be given to students by the professors, and this work carefully examined. The second-year students will be divided into sections, and there will be discussions and papers upon the subjects gone over in the first and second year's study.

### THIRD YEAR.

#### *First Semester.*

Real Property. Professor VANCE. Lectures and Conferences. Four hours. *Book II of Blackstone, special cases and notes.*

Equity Pleading and Practice. Professor CLEPHANE. Lectures and Conferences. One hour. *Shipman or Fletcher on Equity Pleading and special cases.*

Federal Procedure. Professor MAURY. Lectures and Conferences. One hour. *"Curtis' Jurisdiction of United States Courts" and "Maury's Federal Jurisdiction and Procedure."*

Criminal Procedure. Professor EARNEST. Lectures and Conferences. One hour. *Clark's Criminal Procedure.*

Wills and Administration. Professor PETER. Lectures and Conferences. One hour.

Moot Courts. Professors CLEPHANE, PETER, and EARNEST. Two hours.

#### *Second Semester.*

Equity Jurisprudence. Professor TUCKER. Lectures and Conferences. Two hours. *Special Cases.*

Bankruptcy and Insolvency. Professor BRANDENBURG. Lectures and Conferences. One hour. *Brandenburg on Bankruptcy.*

Trusts and Trustees. Professor TUCKER. Lectures and Conferences. One hour.

Organization of Corporations. Professor CLEPHANE. Lectures and Conferences. One hour.

Admiralty Law and Procedure. Professor HUGHES. Lectures and Conferences. One hour. *Hughes on Admiralty.*

Organization of Trusts and Trades Unions. Professor NEEDHAM. Lectures and Conferences. One hour.

Conflict of Laws. Professor TAYLOR. Lectures and Conferences. One hour. *Minor's Conflict of Laws.*

Moot Courts. Professors CLEPHANE, PETER, and EARNEST. Two hours.

Third-year examinations will be held at the conclusion of each course in the following subjects: Real Property; Equity Pleading and Practice; Federal Procedure; Criminal Procedure; Wills and Administration; Equity Jurisprudence; Bankruptcy and Insolvency; Trusts and Trustees; Organization of Corporations; Admiralty Law and Procedure; Conflict of Laws. The grades received in Moot Court work are counted in determining the student's final standing.

The third-year course will also be carried on by special lectures and the study of selected cases; special courses of reading will be assigned, and each student in the third year will take part in the preparation of cases in the Moot Courts, law and equity, upon such a statement of facts as a client would give to a lawyer in active practice, the cases to be carried through from the commencement of the action to a final hearing, according to rules of procedure prepared by the professors in charge of the Moot Courts; cases may be taken by appeal to the Appellate Moot Court. This gives the student practice and drill in determining what actions will lie upon a given state of facts, what defenses may be interposed, and the various steps in the conduct of cases in court. These courts will be presided over by professors and lawyers from the Washington Bar.

#### GRADUATE COURSE.

##### LEADING TO THE DEGREE OF MASTER OF LAWS.

###### *Fourth Year.*

Comparative Constitutional Law. Professor TUCKER. One hour.

International Public Law. Professor BREWER. *Hall's International Law.* One hour.

Transportation and Interstate Commerce Law. Professor NEEDHAM. One hour.

Roman Law. Professor HOWE. One hour. *Howe's Studies in the Civil Law.*

Comparative Politics and Political Geography. Professor SWISHER. Two hours.

Advanced Procedure (Pleading, Practice, and Evidence) and Office Practice. Practical Instruction and Exercise in the preparing of legal papers. Professor CLEPHANE. One hour.

Class Conference. Roman Law. Mr. HAU. One hour.

Moot Courts (including appellate pleadings). Professors CLEPHANE, PETER, and EARNEST. Two hours.

Fourth-year examinations will be held at the conclusion of each course in the following subjects: Comparative Constitutional Law; International Public Law; Transportation and Interstate Commerce Law; Roman Law; Comparative Politics and Political Geography; Advanced Procedure. The grades received in Moot Court work are counted in determining the student's final standing.

#### PATENT LAW COURSE.

A special course in Patent Law and Patent Law Practice will be conducted by Professor Church, giving thorough preparation to those who contemplate entering that department of jurisprudence. This course covers a period of eight months, with two lectures or sessions of the Moot Court each week. The degree of Master of Patent Laws will be conferred upon those who pass satisfactory examinations at the close of the term. Only graduates in law or members of the bar are eligible to the degree, but any person qualified to profit by the instruction offered will be admitted to the course.

A special course of lectures on Substantive Patent Law is delivered by Hon. Frederick I. Allen, the Commissioner of Patents.

#### ORATORY.

This course is in charge of Professor Channing Rudd, and is designed to give practical, common-sense training in oratory and public speaking. By culture the voice is made rich, powerful, and flexible, the body trained to aid in the expression of thought and emotion, and the mind trained to quick, clear, and logical thinking. The course includes voice culture, chest cultivation, deep breathing, gesticulation, self-control, extemporaneous speaking, argumentation, debating, and brief drawing.

Opportunity for the practical application of the principles and exercises taught is afforded by the Junior Congress of the United States. The Congress is composed of members of the

oratory classes and is modeled after the National Congress, being a legislative body in work and organization.

#### COURSES IN ARTS AND SCIENCES.

Students taking a full course for a degree may be admitted, without additional fee, except laboratory fees, to courses for which they are qualified, in the Department of Arts and Sciences, provided such courses do not exceed in the aggregate six periods per week.

#### EXAMINATIONS.

Written examinations will be required upon each subject specified in the courses and will be given at the conclusion of each subject. At the close of the third year a general review and examination may be required. The standing of the student in the several examinations and in the class conferences and his legal attainments, the regularity of his attendance, and his character will determine his right to the degree.

#### DEGREE OF BACHELOR OF LAWS.

The degree of Bachelor of Laws will be conferred upon students who shall have passed satisfactory examinations upon the subjects required in the entire course of three years and whose attendance and conduct have been satisfactory to the Faculty.

#### DEGREE OF MASTER OF LAWS.

The degree of Master of Laws will be conferred upon students who shall have successfully completed the work of the fourth year and whose attendance and conduct have been satisfactory to the Faculty.

#### PRIZES.

A prize of \$100, called "The Parker Prize," in honor of its donor, Hon. Myron M. Parker, is awarded each year to the student who attains the highest general average in examinations during the full three-years' course for the degree of Bachelor of Laws.

A prize offered by the Edward Thompson Company, of a set of the Encyclopædia of Law, first or second edition, or a set of

the Encyclopædia of Pleading and Practice, is awarded each year to the senior law student who shall write the best thesis on some legal subject to be assigned by the Faculty.

Three prizes—one of \$40, one of \$30, and one of \$20—are annually given to the respective authors of the best three essays handed in by such members of the Third-Year Class as shall compete for them and shall pass a successful examination.

A prize of \$25 in gold, given by John Thilman Hendrick, and called the "David S. Hendrick Memorial Prize in Insurance Law," in honor of Mr. David S. Hendrick, will be awarded each year to the student in the Second-Year Class who writes the best essay upon some question in Insurance Law which will be selected and approved by the Faculty.

A prize of \$25 in gold, offered by Mr. Fritz von Briesen, called the "Ellsworth Prize," is awarded for the best work done in the Patent Law Course by a student receiving the degree of Master of Patent Laws.

Gold medals and book prizes for excellence in intercollegiate and inter-society debates are awarded by the University.

#### LAW LIBRARY AND READING ROOM.

IN CHARGE OF PROFESSOR VANCE.

A well-equipped working library, comprising 4,000 volumes, is open to the students in Law Lecture Hall from 9 a. m. to 10 p. m. Competent librarians are in charge and will give students assistance in looking up subjects and in the use of books.

The library contains the standard text-books, the West Reporter system of Federal and State decisions complete, State Reports, the English Common Law and Chancery Reports, Encyclopædias of Law, Digests, reference books, and current law publications.

Adjoining the Library is a conversation room for students, affording opportunity for consultation.

In addition to these facilities, the students have free access to the great Congressional Library and other public libraries in the city.

#### ADMISSION TO THE BAR.

By the rules of the Supreme Court of the District of Columbia, applicants for admission to the Bar are required to have studied law for three years under the direction of a competent attorney, but by those rules the course in the Department of Law of the University is regarded as discharging this requirement.

## FEES.

1. University matriculation fee (payable but once)	\$5
2. Annual library fee	2
3. Tuition fee per annum for regular course	100
4. Tuition fee per annum for course in Patent Law	40
5. Tuition fee per annum for course in Oratory	15
6. Graduation fee	10

All tuition fees are payable semi-annually in advance.

NOTE.—*Students withdrawing before the close of an academic year are required to give immediate written notice to the Registrar of the University, otherwise no deduction from the full year's fees will be made.*

Graduates of the Department of Law with the degree of Bachelor of Laws are admitted without examination to the Department of Jurisprudence and Diplomacy for the degree of Master of Laws.

For catalogues, application blanks, and further information regarding the Department of Law, address

CHANNING RUDD, Registrar,  
Columbian University,  
Washington, D. C.

## STUDENTS IN DEPARTMENT OF LAW.

*First Year.*

Name.	Legal address.	City address.
Adams, William Waugh.....	D. C....	78 V Street.
Alden, Levi Russell . . . . .	D. C....	809 L Street.
A. B., Columbian University.		
Annett, Arthur Spencer . . . . .	N. H. . .	913 L Street.
Ausmus, Jack . . . . .	Okl. Ty.	17 Grant Place.
Babcock, James Earle . . . . .	D. C....	709 G Street.
Badger, Carlos Ashley . . . . .	Utah . .	U. S. Senate.
Baker, Thomas Mann . . . . .	Ga . . .	U. S. Geological Survey
Barker, John Richard . . . . .	N. C....	212 8th Street, N. E.
Barnard, Charles Daniel . . . . .	N. H....	220 2d Street, N. E.
Beeler, Adam M . . . . .	Ind . . .	930 I Street.
Beers, Morris Phillips . . . . .	Ohio . .	1526 P Street.
Behymer, Glenarvon . . . . .	Cal . . .	1907 I Street.
Betts, Frank Marshall . . . . .	Ark . . .	815 12th Street.
Blair, Fred Johnson . . . . .	Mich . .	1719 G Street.
Blessing, Riley Andrew . . . . .	W. Va . .	66 D Street, N. E.
Booth, Clarence Macgreggor . . . .	Ind . . .	149 K Street.
Boughton, Walter White . . . . .	Ohio . .	1435 Bacon Street.
B. S., Case School of Applied Science.		
Bouie, Charles Norman . . . . .	Md . . .	Rockville, Maryland.
Bowen, Frank Hunter . . . . .	Mass . .	1631 19th Street.
Burnstine, Marcus Henry . . . . .	D. C....	214 C Street.
Busch, Simon Henry . . . . .	Minn . .	1015 L Street.
Butz, David Hazen . . . . .	Pa . . .	510 8th Street, S. E.
A. B., Lafayette College.		
Calver, Arthur Waters . . . . .	D. C....	1721 P Street.
B. S., Columbian University.		
Cheney, Morton Mead . . . . .	N. H . .	205 C Street, S. E.
Coffin, Charles Buxton . . . . .	S. C....	1116 15th Street.
Cohen, Louis . . . . .	Wis . . .	702 19th Street.
Collins, Timothy Edward . . . . .	D. C....	2010 Wyoming Avenue.
Cooke, Levi . . . . .	N. Y....	1305 30th Street.
Cox, Percy Murtaugh . . . . .	D. C....	Department of Justice.
M. D., Columbian University.		
Crist, Lucien Bainbridge . . . . .	D. C....	1456 Euclid Street.
Crittenden, Willie Lewis . . . . .	Va . . .	930 I Street.
Croissant, Victor George . . . . .	Wash . .	1717 Q Street.
Cunningham, John Benedict . . . . .	W. Va . .	1013 14th Street
Davidson, Herbert King, Jr. . . . .	Mass . .	1016 I Street.

*Department of Law.*

169

Name.	Legal address.	City address
De Woody, Charles Frederick	Ohio	The Magnolia.
Dobbins, Donald Claude	Ill.	3008½ U Street.
Dobson, Brainerd Murat	S. C.	U. S. Civil Service Com
Drysdale, James Murray	Colo.	Patent Office.
Dunning, Charles Crever	Pa.	1327 Q Street.
A. B., Dickinson College.		
Dunning, Daniel Alfred	Utah	222 Seaton St., Eekingt'n.
Ebel, Rudolph	Idaho	201 East Capitol Street.
Fairbanks, Frederick Cole	Ind.	1800 Massachusetts Ave.
A. B., Princeton		
Farrell, George Joseph	D. C.	638 2d Street. N. E.
Fields, George Henry	Idaho	210 A Street, S. E.
Fisher, Arthur Ames	D. C.	1718 Corcoran Street.
Flowers, Allen Gilbert	S. C.	1224 13th Street.
Ford, Harvey	W. Va.	2117 Bancroft Place.
Fowler, Wilbur Walter	Mass.	1529 Q Street.
Fraysier, Frank	Utah	Post Office Department.
Fullam, Edwin Winfield	N. J.	810 F Street.
Furbershaw, Walter Louis	N. Y.	U. S. Pension Bureau.
Garnett, Philip Manly	N. H.	1347 U Street.
George, Horace Reid	Pa.	941 O Street
Gibbs, Alexander Campbell	Tenn.	132 B Street, N. E.
Goodall, Milo B	Wis.	705 A Street, N. E.
Gray, Gordon	Pa.	
Gray, Powell Fred	Mo.	617 H Street
Groomes, Leonard Weer	Md.	1405 New York Avenue.
Handy, Wallace Stuart	Del.	
Harralson, Morris K	Ga.	1016 15th Street.
Hay, Charles Edward, Jr.	D. C.	War Department
Hazard, Elmont Bibb	D. C.	320 E Street, N. E.
Hendry, Moses Walton	Md.	Bethesda, Md.
A. B., Johns Hopkins University		
Hermann, Elbert Border	Oregon	1742 S Street.
Hirth, John Philip	D. C.	2918 Sherman Avenue
Hoch, Homer	Kansas	1124 12th Street.
A. B., Baker University		
Hodges, Lewis	D. C.	1607 Kenesaw Avenue
Holman, Valentine Brunner	D. C.	The Cairo.
Hopkins, Fred Merriam	Mich.	U. S. Patent Office.
B. S., University of Michigan.		
Hughes, Eddings Thomas	S. C.	732 12th Street.
B. S., Clemson Agricultural College		
Huntzberger, I. Witman	Pa.	1219 Mass. Avenue S. E.
A. B., A. M., Lebanon Valley College.		

Name.	Legal address.	City address.
Hurd, Sumner Webster.....	N. J....	427 4th Street.
Jackson, William Elbert.....	N. Y....	1318 I Street.
Jones, William Parker.....	Mass....	Department of State. A. B., Tufts College.
Knowles, Elvin Emery.....	Mass....	1231 11th Street.
Kwis, Arthur Frederick.....	Ohio....	1435 Bacon Street. B. S., Case School Applied Science.
Lamb, Walter Clark.....	Nev....	U. S. Senate.
Law, Frank A., Jr.....	D. C....	1627 14th Street.
Leech, Wilmer R. S.....	Md....	2302 1st Street.
Lerch, Harry Ferdinand, Jr.....	D. C....	1520 M Street.
Letcher, John Talbert.....	Ala....	1129 6th Street.
McClurg, Harper James.....	Pa....	511 L Street.
McEntee, George William.....	D. C....	333 C Street.
McGee, Le Roy Almer.....	Wis....	5512 7th Street.
McGrew, Joe Townsend.....	Kansas.	1720 H Street.
McLean, Donald Halmann.....	N. J....	1715 De Sales Street.
McNamee, Tom Walter.....	S. Dak.	8 B Street. N. E.
Mahon, John Wilfred.....	Ohio....	1327 14th Street.
Meyers, Herbert Walter.....	Md....	216 A Street. S. E.
Milhado, Alexander Gordon.....	D. C....	1016 15th Street.
Miller, Edward Edwin.....	Ill....	Congressional Hotel.
Mitchell, Lennard Harris.....	Ind....	2503 14th Street.
Monaghan, James Charles.....	D. C....	1335 F Street. A. B., A. M., Brown University.
Morris, Charles Wesley.....	D. C....	1334 V Street.
Morris, Jackson Richard.....	Ky....	1721 Corcoran Street.
Muhleman, Donald Cassius.....	D. C....	1512 8th Street.
Munn, Henry Farwell.....	D. C....	1334 R Street.
Neal, Albert Boyd.....	Tenn....	1328 11th Street.
Newmyer, Alvin Leroy.....	D. C....	814 M Street.
Newnham, Stephen Lynne.....	Mich....	208 Delaware Avenue.
Newton, Henry Fairfax.....	D. C....	610 13th Street.
Nissen, Charles Mathias.....	Ohio....	U. S. Patent Office. B. S., Case School Applied Science. M. S., Columbia University.
Nixon, John Thomas.....	N. H....	1016 I Street.
Paddock, William W.....	Iowa....	1339 14th Street.
Parris, Albion Keith, Jr.....	D. C....	3022 P Street.
Parsons, George Winfred.....	Mich....	P. O. Department.
Patterson, Thomas Hansford.....	Va....	1300 Pennsylvania Ave.
Poe, Charles Kennedy.....	D. C....	808 17th Street.
Prince, Earle Seaton.....	D. C....	742 New Jersey Avenue.
Quigley, Richard John Francis.....	N. Y....	76 L Street.

*Department of Law.*

171

Name.	Legal address.	City address.
Rainey, George Francis .....	D. C. ...	3317 N Street.
Reed, Roy Martin .....	D. C. ...	
Reinhold, Franz .....	D. C. ...	806 12th Street.
Rhoads, William L. ....	Pa. ....	2824 Brightwood Ave.
Richardson, Daniel Judson.....	N. Y. ...	1322 L Street.
Ph. B., Syracuse University.		
Ross, Charles .....	N. C. ...	206 Delaware Ave., N. E.
Ruffner, Charles Edward.....	Va. ....	519 6th Street.
Sanders, Franklin Oliver.....	Pa. ....	807 6th Street.
Schauer, Fred Hayes.....	Cal. ....	2812 13th Street.
B. L., B. S., Occidental College, California.		
Schnucker, George Bertram.....	La. ....	1736 Corcoran Street.
Sebastian, Frank Elmer.....	Ill. ....	1101 K Street.
LL. B., Benton College of Law.		
Sell, John Carlisle.....	D. C. ...	139 C Street, N. E.
Shaw, Milton Buck .....	Ky. ....	1903 F Street.
Shelton, Leonard Guy.....	Miss. ...	1719 G Street.
B. S., Mississippi A. & M. College.		
Shepherd, Arthur Charles.....	Wis. ....	Hyattsville, Md.
Sherman, Cecil Kent.....	Va. ....	944 New York Avenue.
Sherman, Henry William.....	N. Y. ....	103 Corcoran Building.
Shipper, Alva Hamilton.....	W. Va. ...	428 7th Street, S. W.
Simpson, James T. ....	N. H. ...	Treasury.
Sisson, Irvin.....	Col. ....	
Sleman, Paul E.....	D. C. ...	3107 Mt. Pleasant Street.
Smith, James Cheetham.....	Pa. ....	1208 East Capitol Street.
Staples, Eugene Washington.....	Me. ....	340 C Street.
Steele, Amos Arville.....	Va. ....	121 Maryland Ave., N. E.
Stern, Morris .....	Wis. ....	382 Navy Department.
Stetson, Frank.....	D. C. ...	1324 12th Street.
Strong, Shepard.....	Vt. ....	1539 I Street.
Sunderlin, Louis Kossuth.....	Iowa ...	Interior Department.
Swingle, Edwin Allan.....	D. C. ...	807 T Street.
Taggart, Giles Russell .....	N. J. ....	Department of Commerce and Labor.
B. S., Columbian University.		
Thompson, Edward Cyrus.....	Iowa ...	1641 13th Street.
B. S., M. E., Columbian University.		
Tilden, Myron Winfield .....	Conn. ...	1246 Columbia Road.
Towles, Therrett.....	D. C. ...	2416 14th Street.
Turnure, Edward Decator.....	Mo. ....	100 C Street, S. E.
Veley, Omar Jay.....	N. Y. ....	1369 Emerson St., N. E.
Voorhis, Charles Doty.....	N. J. ....	The Cairo.
Vorkoeper, John.....	Wis. ....	1921 G Street.
Walker, Allan Elliott.....	D. C. ...	3140 Q Street.
Walker, Horace.....	Chile...	Chilean Legation.

Name.	Legal address.	City address.
Wallace, Reuben Staten.....	Md.....	206 Elm Street.
Wallis, William James .....	N. H. ...	1435 Bacon Street.
A. B., Dartmouth College.		
A. M., Columbian University		
Weitzel, Fred William.....	Ky.....	1108 S Street.
Whitney, Gorham Folsome.....	Mich....	320 Delaware Ave., N. E.
Williams, James Dawson.....	Md.....	1327 10th Street.
A. B., Western Maryland College.		
Wilmot, Wilson Hardley... ..	N. Y....	2224 F Street.
Wolfe, Edmund Stanley.....	Md.....	2104 1st Street.
Woods, Walter Orr.....	Kansas <sup>9</sup> .	913 Massachusetts Ave.
Woodwell, William Herbert, Jr.....	Conn....	418 Bond Building.
Woolworth, Gilbert Sylvester.....	N. Y. ...	1313 New York Avenue
A. B., Union College.		
York, Arthur Blaine .....	W. Va..	1009 13th Street.
Young, Berkeley Reynolds.....	Pa.....	2212 Massachusetts Ave

*Second Year.*

Alderson, George Price... ..	W. Va..	1200 O Street.
Armstrong, Ernest Patterson .....	Iowa ...	711 K Street.
I. L. B., National University		
Baldwin, Julius Lyman.....	N. Y....	2905 14th Street.
A. B., Princeton University.		
Barrett, Jesse William... ..	Mo.....	The Garfield.
A. B., L. B., Christian University.		
Beller, James William.....	W. Va..	1246 Princeton Street
Belitz, Arthur Frederick.....	Wis ....	136 D Street, N. E.
Bone, Leonie .....	Ill.....	Pension Office.
Boynton, Lewis Thurston .....	D. C....	1119 B Street, N. E.
Bradley, Charles Hamilton .....	D. C....	2013 Q Street.
Bradley, Thomas Chiles .....	S. C....	1007 Mass. Ave., N. E.
Buettner, Philip.....	Wis ....	1410 Q Street.
Bullock, T. Wingfield .....	Va .....	1445 Massachusetts Ave
Burkett, John Martin.....	Ind.....	623 19th Street.
Buxton, Edgar .....	N. H. ...	919 I Street.
Campbell, Willard .....	Wis ....	1034 Connecticut Avenue
Candamo, Manuel Rafael. ....	Peru....	1701 Massachusetts Ave
Carpenter, Henry Fayette .....	Wis ....	1012 13th Street.
B. L., University of Wisconsin.		
Chase, Enoch Aquila.....	Kansas.	The Brunswick.
Church, Durant.....	D. C....	1608 20th Street.
Clark, Frederick Francis .....	D. C. ...	504 E Street.
Clark, Paul Maltby .....	Colo....	815 15th Street.
Cole, Charles Orlando.....	Okl. Ty.	311 F Street, N. E.

*Department of Law.*

173

Name.	Legal address.	City address.
Cook, Richard John.....	Ark ....	Linden, Maryland.
Crowell, William Butterworth .....	Ohio ...	1600 Park Street.
Cull, Judson Thomas.....	D. C....	114 2d Street, S. E.
Cutting, Silas Henry.....	Mich...	Pension Bureau.
Dahl, Arthur L.....	Kansas.	1327 14th Street.
Davis, Carl Allen.....	Idaho...	1002 11th Street.
Day, Leonard..	Mass....	The Brunswick.
S. B., Worcester Polytechnic Institute.		
Dearing, Milton Matthews .....	Mo.....	2011 Q Street.
A. B., University of Missouri.		
Douglass, Lloyd A.....	D. C....	1112 6th Street.
Dresser, Jasper Marion ..	Pa.....	The New Willard.
B. S., Purdue University.		
Edelstein, Samuel.....	Wis ....	Pension Bureau.
Ferris, Otho Leonard.....	Iowa....	2014 H Street.
Ph. B., Cornell College (Iowa).		
Ford, Edgar Werner .....	N. Y....	608 Mass. Avenue, N. E.
Fox, Carlton....	N. J....	The Portner.
Franklin, John Knox.....	Ala....	The Lincoln.
Gaddess, Eugene L.....	Va.....	1419 R Street.
Gaskill, James Robbins.....	N. C....	The Litchfield.
Gates, Otis Haskell.....	Fla.. ..	1306 13th Street.
Gordon, William Alexander, Jr.....	Mont...	6 Cooke Place.
Graebing, Lawrence Stoddard.....	Pa.....	603 Florida Avenue.
Graves, J. Morris.....	Mo.....	Agricultural Department.
Gregg, John William.....	Va.. ...	1320 F Street.
B. L., Swarthmore.		
M. A., Cornell University.		
Griesbauer, John Andrew, Jr.....	D. C....	1322 W Street.
Griggs, Irving Elmon.....	D. C....	614 Penn. Avenue, S. E.
Hall, Mortimer Beecher .....	Md....	Gaithersburg, Md.
B. S., Columbian University.		
Hanes, Harvey Earleton.....	Va.....	1119 K Street.
Hathaway, Alvin Dolph.....	Ky.....	General Land Office.
Hellerstedt, Carl John.....	Tenn...	1218 12th Street.
Hengstler, Herbert C.....	Ohio ...	38 Florida Avenue.
Hertford, Frederick Ravenwood ...	D. C....	2926 14th Street.
Hickox, Birdette P.....	Mich...	701 7th Street, N. E.
Hills, Ralph Warren .....	Ohio ...	The Marlborough.
B. S., Columbian University.		
Hindman, Philip Rea .....	Pa.....	1715 De Sales Street.
Holland, Michael Joseph .....	Mass ...	1416 K Street.
Holtzman, William Mortimer.....	Va ....	1321 F Street.
Hubberd, Frank Hobson .....	D. C....	1804 17th Street.
Huff, Thomas Salisbury.....	N. Y....	1645 K Street.

Names.	Legal address.	City address
Hurd, Walter Clarence.....	Utah ...	814 22d Street.
Hutchinson, George Alexander .....	Md. ....	927 F Street.
Imbrie, Robert Whitney .....	D. C. ....	1326 14th Street.
James, Charles Grant .....	Ohio ...	1712 F Street.
Janney, Laurence Aquila .....	D. C. ....	1671 31st Street.
S. B., Harvard University.		
Johnson, Frederic E. ....	D. C. ....	1630 16th Street.
Johnson, Walter Slicer .....	Wash. ....	467 M Street.
Jordan, Cornelius Hughes .....	Tenn ...	817 12th Street.
Keener, John W. ....	Tenn ...	738 8th Street.
A. B., Grant University.		
Keller, Albert Hearl . ....	Iowa ...	The Windsor.
Kelly, Gilbert Walker .....	D. C. ....	2702 13th Street.
A. B., Princeton University.		
Kelly, Guy Edward .....	S. Dak .	9 B Street.
Lavelle, Thomas Daniel .....	Mass ...	
A. B., Boston College		
Lee, John Augustus .....	Wash. ....	1012 12th Street.
A. B., Pacific University.		
Leet, Alfred Bryan .....	D. C. ....	1405 G Street.
Linton, Irwin Helffenstein .....	D. C. ....	1825 2d Street, N. E.
B. A., Erskine College, S. C.		
McClair, Charles .....	Kansas .	Patent Office.
A. B., Kansas State University		
McCormick, Alexander Hugh, Jr. ....	Va. ....	2910 14th Street.
McMahon, John Patrick .....	D. C. ....	1441 S Street.
Marine, Clarence Leroy .....	Neb. ....	The Llewellyn.
Marvin, Arba B., Jr. ....	Wis. ....	2032 16th Street.
S. B., University of Wisconsin.		
Maught, John Andree .....	Md. ....	1322 L Street
Maul, A. George .....	Ohio ...	1327 14th Street.
May, Robert Harold .....	Ind. ....	1919 S Street.
Moore, Frederick McCullough .....	Md. ....	Stratford Hotel.
Moore, Langdon .....	N. Y. ....	1755 P Street.
Montague, James Edward .....	Minu. ....	1711 Lincoln Ave., N. E.
Morse, Howard Moore .....	Mass ...	U. S. Patent Office.
S. B., Worcester Polytechnic Institute.		
Moses, Edmund Quincy .....	Mass ...	1114 14th Street
S. B., Howard University.		
Moulden, Elmer Lyman .....	D. C. ....	1305 Rhode Island Ave.
Naff, Clarence Raymond .....	Kansas .	The Brunswick.
Naylor, Horace Strait .....	D. C. ....	407 Massachusetts Ave.
Newmyer, Edwin Jonathan .....	Mo. ....	1012 14th Street.
Nye, Luther Bertram .....	D. C. ....	936 O Street.

Name.	Legal address	City address
Pepper, Irwin St. Clare .....	Iowa. . .	32 Lawrence Building.
B. S., S. Iowa Normal.		
Perez, Filemon Enriquez.....	P. I. ....	The Litchfield.
Peterson, Joseph H .....	Idaho ..	810 12th Street.
Pharr, Robert Baxter.....	N. C. ....	715 12th Street.
B. A., Erskine College, S. C.		
Porter, Minott Eugene.....	Ohio ..	1517 35th Street.
B. S., C. E., University of Michigan.		
Povey, Richard Granville.....	Conn ..	Patent Office.
B. S., Wesleyan University		
Pratt, Ralph Baldwin.....	D. C. ....	9 Iowa Circle.
Price, James Hardy .....	S. C. ....	Colorado Building
Quinter, William Keyes.....	D. C. ....	3322 14th Street.
Rhodes, Fred Burnett.....	Md.....	1466 Bacon Street.
Richards, George Lawrence.....	D. C. ....	1225 Connecticut Avenue
B. S., Sorbonne		
Rickard, James Bickle .....	Hawaii	1635 L Street.
Riddell, Charles Francis.....	Wash....	910 12th Street.
A. B., Stanford University		
Sagmeister, Joseph .....	Ohio ....	Senate Post Office.
Schley, George Bigelow .....	Ohio ....	1810 16th Street.
B. S., M. A., Kenyon College.		
Searle, William Daniel.....	N. Y. ....	1131 12th Street.
Sedgwick, Joseph Albert.....	Iowa ..	78 Q Street.
Shaffer, Charles Henry .....	Md .....	1303 Clifton Street.
S. B., St. John's College.		
Shore, Howard James.....	N. C. ....	1002 H Street, N. E.
Smith, Joseph Walter.....	Md.....	Law Department.
Snell, Arthur Veeder .....	N. Y. ....	U. S. Treasury.
B. L., Hobart College		
Ph. B., University of Chicago		
Sperl, William John .....	Mass ..	4409 Kansas Avenue.
S. B., Worcester Polytechnic Institute.		
Spinks, Edgar .....	Miss....	U. S. Gen. Land Office.
Starr, D. Judson.....	Ohio ....	831 18th Street.
Steele, Benjamin Ulen.....	Ky.....	303 E Street, N. E.
Stutler, Delmas Clay .....	W. Va. .	1225 New Jersey Avenue.
Tait, George Lester.....	D. C. ....	610 Tennessee Ave., N. E.
Tellier, Julius Arthur.....	Vt.....	1408 Sheridan Avenue.
A. B., University of Vermont.		
Todd, William Edward, Jr.....	D. C. ....	1311 F Street.
Torres, Antonio Constancio.....	P. I. ....	The Litchfield.
A. B., Ateneo Manila.		
Transom, Frederick.....	Pa.....	2121 First Street.
Waite, William Franklin.....	Ala.....	951 Massachusetts Ave.

Name.	Legal address.	City address.
Walker, Richard Dove.....	D. C....	1101 P Street.
Waring, Luther Heas.....	Pa.....	307 B Street, S. E.
Watson, John Clinton.....	Mich...	Lincoln Apartments.
Ph. B., University of Michigan.		
Watson, Richard Furman.....	S. C ...	1008 N Street.
A. B., Furman University.		
Wilmeth, Warner Lambeth. ....	Texas..	6 I Street.
Wilson, Charles Herbert .....	N. Y...	The Litchfield.
Woods, Orin Hazen.....	Wyo....	1204 O Street.
Wrenn, Herbert Alpheus. ....	Va ....	802 A Street, N. E.
Young, Eugene.....	D. C....	804 7th Street.

## Third Year.

Adams, Sidney De Witt .....	N. Dak.	1014 17th Street.
B. S., University of Minnesota.		
Barnum, Zenns Francis.....	D. C....	The Ethelhurst.
Bennett, Robert Root.....	Ind.. ..	1717 T Street.
Benson, Fred Hodges.....	N.Y....	407 T Street.
Berry, George Augustus.....	D. C....	1102 6th Street.
Bielaski, Alexander Bruce.....	Md.....	1410 Q Street.
Biggs, John Sherman.....	Kansas.	1236 B Street, S. W.
LL. B., Kansas City School of Law.		
Blair, Harry Wallace.....	Mo.....	1211 K Street.
Brosius, Samuel Martin.. ..	D. C....	McGill Building.
Browne, Evans. ....	D. C....	1528 P Street.
Cadel, John Schaaff.....	N.Y....	805 East Capitol Street.
Calderon, Alfredo Alvarez....	Peru....	1701 Massachusetts Ave.
LL. B., Marcus University.		
LL. M., D. C. L., Columbian University.		
Carpenter, Oliver Clinton.....	S. Dak..	Department of Commerce and Labor.
Chatfield, Alonzo Bradley, Jr.....	D. C....	3400 17th Street.
Cook, Paul De Barr. ....	D. C....	62 Q Street.
Copeland, Hilbert Perry.....	Ohio ...	912 I Street.
Cram, Charles Maurice. ....	Me.....	1324 L Street.
A. B., Leland Stanford, Jr., University.		
Davidge, John Washington.....	D. C....	1624 H Street.
A. B., Harvard University.		
Davis, Charles William.....	Kansas.	912 I Street.
Davis, Leslie Ammerton.....	N.Y....	817 14th Street.
Ph. B., Cornell University.		
Davis, William Hammatt.....	N.Y....	1824 California Avenue.
Ely, Orville Ray .....	Ill.....	House of Representatives.
Finkelstein, Henry Charles.....	D. C....	Persian Legation.
Flournoy, Richard Wilson .....	Md.....	Department of State.

*Department of Law.*

177

Name.	Legal address.	City address.
Franklin, Blake.....	Ill.....	General Land Office.
Fritsche, William John.....	Ohio...	1327 14th Street.
Frost, Paul Delavan.....	Iowa...	926 Westminster Street.
Fuller, Leslie Canfield.....	Mich...	Department of Justice.
Geddes, Bond Parker.....	Neb....	War Department.
Goode, Marke.....	Ill.....	2320 1st Street.
Gordon, Erskine.....	D. C....	6 Cooke Place.
Graham, Richard Magness.....	Oregon	226 E Street, N. E.
Graham, Rutherford Hunter.....	W. Va..	1412 15th Street.
Graham, William Russell.....	D. C....	1335 F Street.
Gulliksen, Henry.....	N. Dak.	Ordinance Office, War Dep.
Hackney, William Clyde.....	Ohio...	The Edward.
Harris, Nathaniel.....	Texas..	205 D Street, N. E.
A. B., M. A., Baylor University.		
M. A., Yale University.		
Hau, Carl.....	Germany	1631 19th Street.
Hinton, Bynum Ernest.....	Ark....	734 12th Street.
B. S., Ouachita College.		
Irving, Benjamin.....	Oregon.	General Land Office.
Jones, Oliver Perry.....	Texas..	1410 Q Street.
Kalver, Jacob.....	Ohio...	Treasury Department.
Keblinger, William Wilbur.....	Va.....	1229 Harvard Street.
Klawans, Samuel Thomas.....	D. C....	818 H Street, N. E.
Knapp, Daniel Albert.....	Iowa...	1122 12th Street, N. E.
Knowlton, John Wellington.....	Mass...	2120 G Street.
A. B., Tufts College.		
Kruse, Fred Henry.....	Ohio...	1327 14th Street.
Layne, Carney Milton.....	Ohio...	1410 Q Street.
Leach, Boynton McConnel.....	D. C....	1901 K Street.
B. S., Columbian University.		
Leavitt, Leon Brooks.....	Me.....	3012½ U Street.
A. B., Bowdoin College.		
Lightfoot, John Jerome.....	D. C....	McGill Building.
Lindal, Lewis Forest.....	N. Y....	2146 F Street.
Lindberg, Edward John.....	Ark....	120 D Street, N. E.
Loud, Charles Sumner.....	Mich....	1410 Q Street.
Loyd, Elbert Hilles.....	N. Y....	2111 1st Street.
A. B., Colgate University.		
McCarty, Harry Clinton.....	Me.....	1338 Yale Street.
A. B., Bowdoin College.		
McLaughlin, James Alexis.....	D. C....	1221 K Street.
Mann, Ray.....	Ky.....	2566 University Place.
Markham, Carl Orrin.....	Mich...	1367 F Street, N. E.
Martin, Harold Hudson.....	Kansas.	1316 L Street.
A. B., Midland College.		

*Columbian University.*

Name.	Legal address.	City address.
Masterson, Mahlon Curtis.....	Cal.....	Department of Justice.
Merritt, Leonard Atkins.....	Minn....	154 F Street, S. E.
Moore, James Raymond.....	Ala.....	2211 F Street.
Moulton, Harry Dodge.....	D. C....	The Logan.
Panabaker, Reuben John.....	Mich....	1433 U Street.
Perry, Frank Howard.....	Ala.....	421 T Street.
Person, Robert S.....	S. Dak..	3112 Q Street.
Peterson, Frank W.....	Mich....	1021 8th Street.
Peterson, Norman Ellsworth.....	Minn....	1414 H Street.
Pratt, Elwood Scott.....	D. C....	24 Iowa Circle.
Proctor, James McPherson.....	Md.....	Lincoln Apartments.
Raley, James Roy.....	Oregon..	1410 Q Street.
Rogers, Carl McLean.....	Ill.....	1466 Bacon Street.
Roome, Henry Sherburne.....	N. Y....	1240 Princeton Street.
Russell, William H.....	Pa.....	1240 Princeton Street.
Sanchez, Bonifacio.....	Porto Rico,	1761 P Street.
Scott, Thomas Allen.....	Mo.....	1236 B Street, S. W.
Sherier, James Thomas.....	D. C....	Conduit Road, D. C.
Sherier, Joseph Tyler.....	D. C....	Conduit Road, D. C.
Shibley, James George.....	Kansas..	1316 L Street.
Skiles, Aubrey Matson.....	Ohio....	1309 H Street.
A. B., Northwestern University.		
Snow, Hubert Marcey.....	D. C....	3321 14th Street.
Stanley, James Garfield.....	S. Dak..	The Capitol.
A. B., University of Minnesota.		
Swan, Arthur R.....	N. Y....	1129 Dartmouth Street.
Tripp, James Orlando.....	Ohio....	1125 10th Street.
Wagner, Meyer Clyde.....	Texas ..	1123 6th Street.
Ward, Amasa James.....	Iowa....	1352 N. C. Avenue.
Warner, Lee Frost .....	Minn....	1410 Q Street.
Whitford, George Langdon.....	Minn....	112 East Capitol Street.
Willey, Israel Emerson.....	Utah....	5 Tenn. Avenue, N. E.
Williams, Hugh, Jr.....	N. Y....	46 B Street, N. E.
Wilson, Jesse Henry, Jr.....	D. C....	2914 P Street.
A. B., Cornell University.		
Woolwine, Thomas Lee .....	Cal.....	816 18th Street.
LL. B., Cumberland University.		

*Review Students.*

Anderson, Edward Dunning.....	D. C....	2813 14th Street.
Brewer, John .....	Md.....	631 Pennsylvania Avenue.
LL. B., Columbian University.		
Brown, Arthur Harrison.....	Mass....	1906 H Street.
S. B., Massachusetts Institute of Technology.		
LL. B., Columbian University.		

*Department of Law.*

179

Name.	Legal address.	City address.
Butler, Charles Amos.....	Ind.....	1450 Meridian Street.
LL. B., Columbian University.		
Butts, Frank Graham .....	N. Y....	2010 1/2 15th Street.
LL. B., Columbian University.		
Clark, Charles C.....	Pa.....	Dept. of Agriculture.
LL. B., Philadelphia Law School.		
LL. M., Columbian University.		
D. C. L., Columbian University.		
Davis, George Henry.....	Mass....	1823 Q Street.
Dodge, Arthur J.....	Okl. Ty.	1403 F Street.
LL. B., Columbian University.		
LL. M., National University.		
Eichelberger, Frederick.....	Ohio ..	1829 S Street.
LL. B., Columbian University.		
English, Walter Charles.....	D. C....	2907 P Street.
LL. B., Columbian University.		
Franklin, Wallace Collin.....	Ky.....	1221 Mass. Avenue, S. E.
LL. B., Southern Normal, Bowling Green, Ky.		
LL. B., LL. M., Columbian University.		
Gaw, Albert C. ....	Minn...	Kendall Green.
Goodwin, Orlando W.....	Wis....	927 New York Avenue.
Grunwell, Charles Vanderwerken...	Va.....	1515 30th Street.
Harbaugh, James William.....	Ohio ...	1327 10th Street.
LL. B., Columbian University.		
Howard, William J.....	Colo....	1208 T Street.
LL. B., Columbian University.		
Leonard, James Henry .....	Va.....	1015 H Street.
LL. B., Columbian University.		
McCarteney, Hartwell Cragin.....	D. C....	3123 Dumbarton Avenue.
A. B., A. M., Lafayette.		
LL. B., Columbian University.		
Mayer, Charles David.....	Ohio....	332 E Street, N. E.
LL. B., Columbian University.		
Montague, Frederick M. P.....	Ill.....	1008 I Street.
Parkes, George Preston.....	Wis....	915 N Street.
LL. B., LL. M., Columbian University.		
Phillips, Edson .....	N. Y....	Interior Department.
LL. B., Columbian University.		
Pitcher, Eugene H.....	Ill.....	519 11th Street.
LL. B., Columbian University.		
Roberts, Clarence Meredith.....	Md.....	918 23d Street.
LL. B., Columbian University.		
Sharretts, David E.....	Pa.....	The Ethelhurst.
Shore, Francis Marion.....	Ohio ...	1225 New Jersey Avenue.
LL. B., Columbian University.		

*Columbian University.*

Name.	Legal address.	City address.
Tait, Galen Lamar .....	Md.....	205 Colorado Building.
LL. M., D. C. L., Columbian University.		
Tharin, Frank .....	S. C.....	1817 9th Street.
LL. B., LL. M., D. C. L., Columbian University.		
Warren, George Alfred .....	Ill.....	620 I Street.
LL. B., Columbian University.		
LL. M., National University.		
Waterman, Jason.....	Mich...	64½ Bates Street.
LL. B., Columbian University.		

*Special Students.*

Bird, Richard Malcolm.....	N. J....	908 12th Street.
Doherty, Henry Windsor.....	S. Dak..	1008 M Street.
LL. M., University of Buffalo.		
Fowler, Arthur William.....	N. Dak.	821 North Carolina Ave.
Gerdson, William C.....	Minn...	Patent Office.
Jones, Claude Carville.....	D. C....	664 E Street, N. E.
Kreuttner, Joseph Warwick.....	Texas ..	U. S. Geological Survey.
McNary, William Sarsfield.....	Mass...	The Columbia.
Mathewson, William Williams.....	D. C....	408 5th Street.
Mears, Thomas Edward.....	Ark....	1504 11th Street.
B. S., Ouachita College.		
Morgan, Benjamin Stephen.....	W. Va..	50 N Street.
A. B., LL. B., West Virginia University.		
Olson, Olger Herman.....	D. C....	811 5th Street.
Repetti, Frederick Francis, Jr.....	D. C....	149 B Street, S. E.
Rice, Charles O .....	Minn...	Wash. Loan & Trust Bldg.
Sullivan, John Andrew.....	Mass...	1306 O Street
Van Vleck, Frank.....	Cal.....	Navy Department.
M. E., Stevens Institute of Technology.		

*Students in Patent Law.*

Adams, Benjamin Franklin.....	N. H...	1219 L Street.
A. B., Dartmouth College.		
LL. B., Columbian University.		
Alexander, Edward Renick.....	Ohio...	1311 Connecticut Avenue.
M. E., Cornell University.		
LL. B., Columbian University.		
Anderson, Edward Dunning .....	D. C....	2813 14th Street.
LL. B., Columbian University.		
Barr, Robert Mann.....	Mass...	1010 Massachusetts Ave.
B. S., Worcester Polytechnic Institute.		
LL. B., National University.		
Blair, Robert Sherman .....	Conn...	2818 14th Street.
S. B., Massachusetts Institute of Technology.		

*Department of Law.*

131

Name.	Legal address.	City address.
Brooks, James Moffett.....	Pa..... 57 U Street.	
LL. B., LL. M., National University.		
Brown, Arthur Harrison.....	Mass ... 1906 H Street.	
S. B., Massachusetts Institute of Technology.		
LL. B., Columbia University.		
Butler, Charles Amoss... ..	Ind..... 1450 Meridian Street.	
LL. B., Columbia University.		
Clarkson, Edgar James Wallace....	D. C.... 1235 11th Street.	
LL. B., Columbia University.		
Cowles, Arthur Woodruff.....	Conn... 1823 Kalorama Avenue.	
LL. B., National Law School.		
Dowell, Osgood Harrison.....	D. C.,, Wash. Loan & Trust Bldg.	
Ph. B., Yale University.		
LL. B., Columbia University.		
Fenning, Karl Herbert.....	Conn... 513 4th Street.	
A. B., Trinity College, Hartford.		
Heylmun, Clarence Gobin... ..	D. C.... 617 E Street.	
LL. B., LL. M., National University.		
Hodges, William Sisson.....	D. C.... 928 F Street.	
LL. B., LL. M., Georgetown University.		
Ide, George Russell.....	Pa..... Patent Office.	
LL. B., LL. M., National University.		
Johnson, Alan M.....	Mass ... Patent Office.	
McCarteney, Hartwell Cragin.....	D. C... 3123 Dumbarton Street.	
A. B., A. M., Lafayette.		
LL. B., Columbia University.		
Marine, Richard Elliott.....	Ind..... Patent Office.	
A. B., Johns Hopkins University.		
Milans, Calvin Tarkington.....	D. C... 1232 N. H. Avenue.	
LL. B., Columbia University.		
Miller, Clarence Alphonso .....	Mo..... 53 I Street, N. E.	
LL. B., Kansas City School of Law.		
Moulton, Alston Brintnall .....	Mass.... 1231 Princeton Street.	
S. B., Worcester Polytechnic Institute.		
LL. B., LL. M., Columbia University.		
Nathan, Albert Franklin, Jr.....	Mo..... 3447 Holmead Avenue.	
S. B., Massachusetts Institute of Technology.		
LL. B., National University.		
O'Donoghue, Michael.....	Cal..... The Brunswick Flats.	
LL. B., Hastings College of Law, California.		
LL. M., National School of Law.		
O'Neill, Charles J.....	D. C... 910 Mass. Avenue, N. E.	
E. E., Lehigh University.		
LL. B., National University.		
Ritter, Gilbert Powers.....	Ill..... McGill Building.	
C. E., Cornell University.		
LL. B., National University.		

*Columbia University.*

Name.	Legal address.	City address.
Robb, John Franklin.....	Kansas..	827 8th Street, N. E.
LL. B., LL. M., National University.		
Scott, Walter Armitage.....	Ill.....	Patent Office.
Smith, Sidney Fuller.....	Col.....	Patent Office.
M. S., Columbia University.		
LL. B., LL. M., National University.		
Whitney, Fred Brown.....	Ill.....	House of Representatives.
A. B., Williams.		
LL. B., Northwestern University.		

*Review Patent Law.*

De Wein, George F.....	N. Y...	Patent Office.
M. E., Cornell University.		
LL. B., National University.		
M. P. L., Columbia University.		
Edmonds, Frederick Lincoln.....	Mass...	Patent Office.
S. B., Massachusetts Institute of Technology.		
Poster, Bertram Grey.....	Va.....	918 F Street.
Hamlin, George Rathbone.....	D. C....	800 H Street.
Johnson, Benjamin Robert.....	N. Y...	1429 Q Street.
A. B., Hamilton.		
LL. B., Georgetown University.		
M. P. L., Columbia University.		
Tennant, Frederick Adams.....	N. Y...	805 L Street.
E. E., Cornell University.		
LL. B., LL. M., National University.		
M. P. L., Columbia University.		

*Special Patent Law.*

Weeks, Edward Mitchell.....	Pa.....	Cleveland Park, D. C.
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*Recapitulation.*

First Year Students.....	161
Second Year Students.....	134
Third Year Students.....	93
Review Students.....	30
Special Students..	15
Patent Law Students.....	29
Review Patent Law.....	6
Special Patent Law.....	1
Total.....	469

# Department of Jurisprudence and Diplomacy.

## GRADUATE COURSE.

### THE FACULTY.

- CHARLES W. NEEDHAM, LL. D., President of the University,  
Transportation and Interstate Commerce<sup>a</sup> Law.
- HENRY ST. GEORGE TUCKER, LL. D., Dean,  
Professor of Comparative Constitutional Law.
- Hon. JOHN M. HARLAN, LL. D. (Associate Justice of the Supreme Court  
of the United States),  
Constitutional Law of the United States.
- Hon. DAVID J. BREWER, LL. D. (Associate Justice of the Supreme Court  
of the United States),  
International Public Law.
- Hon. JOHN W. FOSTER, LL. D. (Ex-Secretary of State),  
Diplomacy and Treaties of the United States; Duties of  
Ambassadors, Ministers, and Consuls; Boards of Arbitration.
- \*Hon. DAVID J. HILL, LL. D. (Formerly Assistant Secretary of State and  
now Minister to Switzerland),  
European Diplomacy and Treaties.
- Hon. WILLIAM WIRT HOWE, LL. D. (of the New Orleans Bar),  
Lecturer, Ancient Law, Roman Law, Mediæval and Modern Civil Law.
- Hon. MARTIN A. KNAPP, LL. D. (Chairman Interstate Commerce Commission),  
Interstate Commerce Law.
- Hon. CARROLL D. WRIGHT, LL. D. (Commissioner of the Department  
of Labor),  
Statistics and Social Economics.
- CHARLES C. SWISHER, PH. D.,  
Comparative Politics.

<sup>a</sup>Absent on leave.

(183)

HON. HANNIS TAYLOR, LL. D. (Formerly Minister to Spain),  
Constitutional and Common Law of England.

JOHN W. HOLCOMBE, M. DIP.,  
Assistant Professor, Comparative Politics.

CHARLES RAY DEAN, M. DIP.,  
Assistant Professor, European Diplomacy.

CARL HAU, A. M.,  
Instructor in Roman Law.

N. W. HOYLES, K. C. (Principal of Toronto Law School),  
Lecturer, Jurisprudence of Canada.

ROLAND P. FALKNER, PH. D. (The Library of Congress),  
Lecturer, Monetary History.

HON. OSCAR P. AUSTIN (Chief of Bureau of Statistics),  
Lecturer, Interstate and Foreign Commerce.

JOHN FRANKLIN CROWELL, PH. D., L. H. D. (Treasury Bureau of Statistics),  
Lecturer, International Trade and Commercial Geography.

GEORGE WINFIELD SCOTT, LL. B., Ph. D.,  
Administrative Law.

CHANNING RUDD, D. C. L.,  
Registrar of the University.

WILLIAM REYNOLDS VANCE, M. A., PH. D., LL. B.,  
Librarian of the Law Library.

EDGAR BUXTON,  
Assistant Librarian.

ELMER L. MOULDEN,  
Assistant Librarian.

## HISTORICAL.

At the annual meeting of the Board of Trustees of the University in June, 1898, an ordinance was adopted establishing, as a department of the University, the Department of Jurisprudence and Diplomacy.

This Department was opened with appropriate ceremonies at the University November 15, 1898. President McKinley and members of his Cabinet, with many other distinguished men in public life, were present. Addresses were delivered by B. L.

Whitman, D. D., President of the University; Charles W. Needham, LL. D., Dean; Hon. John M. Harlan, LL. D., Associate Justice of the Supreme Court of the United States; Hon. David J. Brewer, LL. D., Associate Justice of the Supreme Court of the United States; Hon. Lyman J. Gage, Secretary of the Treasury; Sir Wilfrid Laurier, Premier of Canada, and Hon. John W. Foster, ex-Secretary of State.

On January 3, 1899, Law Lecture Hall was completed and dedicated. This building is located at 1420 H Street, adjoining University Hall; it is very complete, having three lecture-rooms, a large library, and ample office rooms, the entire building being devoted to the use of the Departments of Law, Jurisprudence and Diplomacy.

### OBJECTS.

This Department is designed to afford a training in the subjects of higher legal knowledge, the political history of the world, the science and practice of diplomacy, and international law. Its courses are intended for lawyers, for students of jurisprudence and diplomacy, for persons who desire to fit themselves for the public, diplomatic, and consular service of the United States, and for those who desire a broad culture upon the larger questions of public life in order that they may better acquit themselves as journalists, legislators, and moulders of public opinion upon the national and international issues of the day. To be an international lawyer or diplomatist one must, in addition to an education which makes one a scholar and lawyer, have special knowledge of the higher and broader subjects of the law and the intercourse between states and nations; to be influential in any public career a man in this day must have a knowledge of political history, the diplomatic relations which have existed between states and nations, the manner in which international controversies have been settled, the currents of international trade and commerce, the general principles of finance as held by civilized nations, and the modern methods of settling international affairs. It is the special object and purpose of this Department to furnish such instruction and opportunities for study at the National Capital, where are to be found the archives containing the history of these subjects and the men who have been called to public life by reason of their special fitness to deal with these questions. From among these public men our professors and lecturers are chosen, and these archives and libraries are open to our students.

### ADMISSION.

Applicants who have taken the degree of Bachelor of Laws in this or any other university or law school requiring three years of study, or members of the bar who from their experience, practice, and acquirements in the profession may be adjudged by the Dean to have the equivalent of the Bachelor's degree, will be admitted to the first year of the course as candidates for the degree of Master of Laws.

Before a student can be admitted to candidature for the degree of Master of Diplomacy or the degree of Doctor of Civil Law he must give evidence that he has completed a liberal undergraduate course of academic study such as is required by colleges of good standing antecedent to the baccalaureate degree. The President's Council reserves the right to decide in all cases whether the antecedent training fulfills the requirements.

Any person approved by the Dean may attend one or more courses of lectures in the Department, have the benefit of the examinations, and receive a certificate for the work done.

**LANGUAGES.** A knowledge of Latin is regarded as essential in both of the law courses to enable students to pursue properly the history of the law. In addition to Latin, one of the modern languages, either French, German, or Spanish, will be required of applicants for the degree of Doctor of Civil Law, and a knowledge of either French, German, or Spanish will be required of those taking the degree of Master of Diplomacy. Students who have not received sufficient instruction in the languages required may obtain it during their course, in the Department of Arts and Sciences.

### COURSES OF INSTRUCTION.

#### SPECIAL LECTURES.

Special lectures upon the jurisprudence of England and her Colonies, Germany, Austro-Hungary, Italy, and Colonial Law will be announced during the year.

A course of lectures upon the Organization of the Diplomatic Service of Other Nations, the History of International Conventions, and the Lives of Great Men will be delivered by some of the Diplomatic Corps resident in Washington and by other distinguished public men.

ASSIGNMENTS.

*First Year.*

Constitutional Law of the United States. One hour.\* Professor HARLAN. *Story on the Constitution.*

Comparative Constitutional Law. One hour. Professor TUCKER.

International Public Law. One hour. Professor BREWER. *Hall.*

Roman Law. One hour. Lectures.

Transportation and Interstate Commerce Law.† Two hours. Professor NEEDHAM.

History of Diplomacy and Treaties of the United States. One hour. Professor FOSTER. *A Century of American Diplomacy.—Foster.*

Statistics and Social Economics. One hour. Professor WRIGHT. *Practical Sociology.—Wright.*

Comparative Politics and Political Geography. One hour. Professor SWISHER.†

Interstate and Foreign Commerce.† Lectures and Conferences. One hour. Professor AUSTIN.

International Trade and Commercial Geography.† Lectures and Conferences. One hour. Professor CROWELL.

Administrative Law.† Two hours. Professor SCOTT.

Class Conference, Comparative Politics. One hour. Asst. Professor HOLCOMBE.

Class Conference, Roman Law. One hour. Mr. HAU.

Class Conference, History of U. S. Diplomacy. One hour.

Latin, French, German, and Spanish. (Special.)

Five hours each week will be devoted to class discussions and conferences, conducted by professors and instructors.

Regular students in this Department may attend classes in the Department of Law without additional fee.

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\* Unless otherwise stated, hours per week throughout the year.

† No text-book.

*Second Year.*

Practice of Diplomacy, Organization of the State Department, Duties of Ambassadors, Ministers, and Consuls, and International Arbitration.\* Two hours. Professor FOSTER.

History of European Diplomacy and Treaties.\* Lectures. One hour.

Laws of Ancient Nations.\* One hour, one-half year.

(a) History and General Principles of the Laws of India, Egypt, Palestine, and Greece.

(b) A General View of the Law in Europe during the Middle Ages.

Roman Law.\* One hour.

(a) History and General Principles of Roman Law to and including the time of Justinian.

(b) The Extension of the Roman Law into some of the Modern States.

The Common Law of England; its History and Extension into some of the Modern States. Two hours. Professor TAYLOR.

Jurisprudence of Germany, France, Spain, and Italy. One hour. Professor ———.

Jurisprudence of Canada. Professor HOYLES.

Interstate Commerce Law. One hour. Professor KNAPP.

Colonial Law. One hour. Professor ———.

Finance.\* One hour. Professor FALKNER.

Economics. One hour.

Comparative Politics. One hour. Professor SWISHER.

Admiralty Law. One hour, one-half year. Professor HUGHES.

History of Colonization. One hour. Professor SWISHER.

Class Conference, Comparative Politics. One hour. Asst. Professor HOLCOMBE.

Class Conference, European Diplomacy. One hour. Asst. Professor DEAN.

Class Conference, Roman Law. One hour. Mr. HAU.

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\* No text-book.

Class Conference, Laws of Ancient Nations. One hour.  
Mr. HAU.

Latin, French, German, and Spanish. (Special.)

Special Lectures, Class Discussions, and Conferences. Five hours.

The class-room work for each year will occupy about ten hours—two hours every week day except Saturday.

### COURSES.

**LAW SECTION.**—Leading to the degrees of *Master of Laws* and *Doctor of Civil Law*.

*Required Course, first year.*

Constitutional Law of the United States.  
Comparative Constitutional Law.  
International Public Law.  
Roman Law.  
Transportation and Interstate Commerce Law.  
Comparative Politics and Political Geography.  
Administrative Law.

Upon the completion of the above course, the student if otherwise qualified may receive the degree of Master of Laws.

*Required Course, second year.*

Laws of Ancient Nations.  
Laws of India, Egypt, Palestine and Greece.  
General view of the law in Europe during the Middle Ages.  
Roman Law.  
Roman Law to and including the time of Justinian.  
The Extension of the Roman Law into some of the Modern States.  
Common Law of England. Its History and Extension into some of the Modern States.  
Comparative Politics.  
Interstate Commerce Law.  
Jurisprudence of Germany, France, Spain, and Italy.  
Colonial Law.  
Social Economics.  
Latin and French, German or Spanish (special).

*Third Year.*

Elective Courses and Research.  
Preparation of Thesis.

(Attendance optional, and only one-half tuition is charged for this year.)

DIPLOMATIC SECTION.—Leading to the degree of *Master of Diplomacy*. Two years.

*Required Course, first year.*

History of Diplomacy of the United States.  
History of Treaties to which the United States  
has been a party.  
Conference on above subjects.  
Constitutional Law of the United States.  
Comparative Constitutional Law.  
International Public Law.  
Comparative Politics and Political Geography.  
Interstate and Foreign Commerce.  
International Trade and Commercial Geography.  
Statistics and Social Economics.  
French, German, or Spanish (special).

*Required Course, second year.*

Practice of Diplomacy of the United States.  
Organization of the State Department.  
Duties of Ambassadors, Ministers, and Consuls.  
International Arbitration.  
History of European Diplomacy and Treaties.  
Comparative Politics.  
Finance.  
Economics (some special branches).  
Admiralty Law.  
History of Colonization.  
Colonial Law.  
French, German, or Spanish (special).

## METHOD OF INSTRUCTION.

Professors conduct the study of the subject to which they are assigned by lectures, required courses of reading, and class discussions and conferences. Where a subject is divided into different branches or subdivisions, special lecturers are introduced who are specially qualified to speak upon the subject assigned.

All subjects are studied historically and comparatively and with a view to arriving at the present conditions and state of the law.

Class discussions and conferences follow each lecture, and students are encouraged to make original research and report their work to the class.

**COMPARATIVE JURISPRUDENCE.** This course begins with the study of the laws of primitive people, the laws of India, Egypt, Palestine, and Greece. Following this is a study of the Roman Law as derived from Greece and developed in Rome itself, down to the time of Justinian; then a general view of the law in Europe during the Middle Ages and tracing the Roman Law to the modern nations in which it now prevails. The rise of the Common Law and its extension to the nations in which it prevails are carefully considered, and then the jurisprudence of the great modern States is studied, giving to each a special lecture course, with class discussions. The relations of England to her colonial empire and the federal system existing in Canada receive special attention. All statutory laws which have a bearing upon the exercise of national power and which affect the relations of nations with each other, as well as the fundamental law, are studied in each course.

This subject is under the general supervision of the Dean, and lecturers are appointed upon the jurisprudence of each nation.

**ROMAN LAW.** *First Year Class:* (1) Introduction to the study of the Civil Law. Origin and development of Roman Law from the decemviral legislation to the Period of Classical Jurisprudence. (2) Roman Private Law as embodied in the writings of the classical jurists, including (a) *jus personarum*, (b) *jus rerum*, (c) *jus actionum*. Muirhead: *The Institutes of Gaius and Rules of Ulpian*. *Second Year Class:* (3) The *Corpus juris civilis* and its place in the History of Roman Law. Selected titles from the *Institutes* (Saudars, Justinian) and *Digest*. Important reforms introduced in *Code* and *Novels*. (4) The relations between Roman Law and early Teutonic Law as appearing in the *Leges Romanæ* and the *Leges Barbarorum*. (5) Revival of the Study of Roman Law. The *Glossators*. Influence of the Canon Law and Scholasticism upon the *Commentators*. Reception of their modified Roman Law in Continental Europe and its subsequent fate. Savigny's *History of the Roman Law during the Middle Ages*. *Seminary Courses:* (a) Comparative study of the Civil Codes of France, Spain, Italy, and Germany. (b) Roman Law in England and Scotland.

**COMPARATIVE CONSTITUTIONAL LAW.** This subject is studied by first considering in a thorough and comprehensive manner the subjects and the scope of the Constitution of the United States; next taking the constitutions of other nations, studying their sources and subjects, comparing their provisions in the light of judicial interpretation by the highest courts of the country with the Constitution of the United States as construed by the Supreme Court of the United States, giving the student a thorough knowledge of the statement of constitutional law in various countries, the scope of each, the subjects treated, the judicial construction, and the points in which our Constitution differs from that of other nations.

**INTERNATIONAL LAW.** This subject is studied with reference to its sources, its sanctions, its present condition, and the lines and scope of its probable development.

**HISTORY OF DIPLOMACY AND TREATIES OF THE UNITED STATES.** The course of lectures on American Diplomacy embraces the duties of ambassadors and ministers; duties of consuls; treaties, their method of negotiation, various forms of, attitude of Congress, rulings of Supreme Court, and historical sketch of most important American treaties; arbitration, principles of, organization and method of procedure; and the Monroe Doctrine.

**HISTORY OF EUROPEAN DIPLOMACY AND TREATIES.** Approaching diplomacy not merely as the science of the relations of sovereign States and the art of conducting negotiations between them, but primarily as the actual transaction of international business, the course of instruction aims to show what European diplomacy really is by the examination of its history. As all important international transactions are summed up and embodied in definite treaties and conventions, the subject can be most profitably discussed by an analysis of these documents, supplemented by an account of the persons, interests, events, forms, ceremonies, and negotiations that have contributed to their development. By this method it is hoped that it may be possible not only to derive inductively the principles of diplomacy as an art and as a science, but also to present an exposition of the present international relations of Europe as determined by the great treaties, from the Congress of Westphalia to the Congress of Berlin, showing the existing affinities, antagonisms, and tendencies of the Chief European powers.

**COMPARATIVE POLITICS; POLITICAL GEOGRAPHY IN ITS RELATION TO POLITICAL HISTORY.** The work in this depart-

ment is designed to put the student in possession of the main results of political development, enabling him to follow the course of history, both in its geographical and in its political movement, with special reference to the structure and influence of the States whose work has been worth most to the world.

**INTERSTATE AND FOREIGN COMMERCE.** This course treats of the internal and foreign commerce of the United States and the international commerce of the world. The growing importance of commerce in its relation both to jurisprudence and diplomacy is discussed, followed by an outline history of commerce, and this is followed by a study of the chief factors in the rapid development of commerce in recent years. The three periods into which commercial history naturally divides itself are considered in outline and the principal causes of the great development which has occurred during the last of these periods are treated in detail. The development of the systems of transportation and production which has resulted in the great commercial activity of today and its relation to international affairs and business conditions at home and abroad are discussed. This general study of commerce and its relation to national and international conditions is coupled with discussions of current events of a national or international character in their relation to, and bearing upon, commerce, present and prospective. The history, philosophy, and present conditions of commerce, internal, national, and international, are thus presented in their relation to general conditions of today and to important current events.

**FINANCE.** This subject is treated broadly with reference to international relations in commerce and banking. It considers the nature and functions of money and credits and their international circulation; also the subject of Public Finance, including the sources of government revenues, bond issues, taxation, the disbursement of the revenues, and the organization of the Treasury Department.

**COURSE OF LECTURES ON INTERNATIONAL TRADE AND COMMERCIAL GEOGRAPHY.** This course of ten lectures is intended to serve as an introduction to the scientific study of modern commerce, and treats of the economic and geographical organization of the world-market from the standpoint of the United States. The two main divisions of the subject, to each of which about an equal amount of attention is given, are: (1) The mechanism of modern commerce, including the rise of commercial nationalities, trade routes, coast lines, and commercial bases (seaports), maritime economics, strategic rail-

ways, and the competitive efficiency of industrial nations. (2) Principles, problems, and policies of international trade, including theories of international exchange, problems arising out of the growth of a new national surplus, problems of commerce between highly developed peoples (United States and Europe), between unequally developed peoples (tropics), and commercial policies as expressed in treaties and tariffs.

One hour a week, with conferences and papers. Professor CROWELL.

TRANSPORTATION AND INTERSTATE COMMERCE LAW. This subject is treated historically, beginning with the public highway, the use of navigable waters, and the construction and operation of canals and railroads; observing the rights of the public; the relations of owners of railroads to the management and the public; theory and practical working of competition and combination; legislative control, and reviewing the Interstate Commerce Law and the decisions thereunder.

STATISTICS AND SOCIAL ECONOMICS. The aim is to teach the principles, theory, and practice of the statistical method, illustrating its use and abuse in presenting data relating to population, production, commerce, wages, prices, crime, etc. Under social economics the course deals with principles of social economics, elements of industrial society, systems of industry, evolution of manufactures, the factory system, the regulation of labor, strikes, arbitration, effects of machinery, prison labor, coöperation, savings institutions, labor legislation, labor organizations, socialism, etc., etc.

#### ORATORY.

This course is in charge of Professor Channing Rudd, and is designed to give practical, common-sense training in oratory and public speaking. By culture the voice is made rich, powerful, and flexible, the body trained to aid in the expression of thought and emotion, and the mind trained to quick, clear, and logical thinking. The course includes voice culture, chest cultivation, deep breathing, gesticulation, self-control, extemporaneous speaking, argumentation, debating, and brief drawing.

Opportunity for the practical application of the principles and exercises taught is afforded by the Junior Congress of the United States. The Congress is composed of members of the oratory classes, and is modeled after the National Congress, being a legislative body in work and organization.

## COURSES IN ARTS AND SCIENCES.

Students taking a full course for a degree may be admitted, without additional fee, except laboratory fees, to courses for which they are qualified, in the Department of Arts and Sciences, provided such courses do not exceed in the aggregate six periods per week.

## DEGREES AND THESES.

The degree of Master of Laws is conferred upon students taking the prescribed course and passing the required examinations.

The degrees of Master of Diplomacy and Doctor of Civil Law are conferred upon students who take the courses prescribed therefor, pass the required examinations, and submit satisfactory and creditable theses.

Theses are required of all students who are candidates for the degrees of Master of Diplomacy and Doctor of Civil Law upon subjects selected by the student and approved by the faculty. The thesis must represent independent thinking and research, and must not be a mere essay or compilation of facts. It must consist in the reasoned presentation of some distinct proposition—not a mere common-place of knowledge—and adapted to illustrate the writer's familiarity with some field of inquiry, his comprehension of the subject chosen, his acquaintance with the sources of information relating to the theme, his power of clear and coherent statement, his capacity for logical arrangement of ideas, and his ability to establish by proof the position he defends. The value of the student's effort will be judged by its exhibition of the qualities above mentioned rather than by its length; but the treatment should be sufficiently extended to furnish evidence of serious investigation and sustained thinking. Clearness and correctness of style are essential, but mere ornament is superfluous. An analytical outline of the argument and the exact citation of authorities, with precise references, are expected. The thesis must be prepared and printed at the expense of the student, as may be required by the faculty, and shall become the property of, and remain with, the Department.

The standing of the student in all the courses and his legal attainments, the regularity of his attendance, and his character will determine his right to the degree.

## EXAMINATIONS.

Written examinations are held at the conclusion of each course of study, and a record is kept of the standing of the students in class conference work.

## PRIZE.

A prize, offered by the Edward Thompson Company, of a set of the Encyclopædia of Law, first or second edition, or a set of the Encyclopædia of Pleading and Practice, is awarded to the regular student in this Department who shall write the best essay on some legal subject, to be assigned by the Faculty.

## LAW LIBRARY AND READING ROOM.

A well-equipped working library, comprising 4,000 volumes, is open to the students in Law Lecture Hall from 9 a. m. to 10 p. m. Competent librarians are in charge and will give students assistance in looking up subjects and in the use of books.

The library contains the standard text-books, the West Reporter System of Federal and State decisions complete, State Reports, the English Common Law and Chancery Reports, Encyclopædias of Law, Digests, reference books, and current law publications.

Adjoining the Library is a conversation room for students, affording opportunity for consultation.

In addition to these facilities, the students have free access to the great Congressional Library and other public libraries in this city.

## FEES.

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|--|-----|
| 1. University matriculation fee (payable but once) | \$5 |
| 2. Annual library fee                              | 2   |
| 3. Tuition per annum for regular course            | 100 |
| 4. Tuition for third year in the D. C. L. Course   | 50  |
| 5. Tuition per annum for course in Oratory         | 15  |
| 6. Special courses per annum, each subject         | 15  |
| 7. Graduation fee                                  | 10  |

All tuition fees are payable semi-annually in advance.

*NOTE.*—Students withdrawing before the close of an academic year are required to give immediate written notice to the Registrar of the University, otherwise no deduction from the full year's fees will be made.

For catalogues, application blanks, and further information regarding the Department of Jurisprudence and Diplomacy, address

CHANNING RUDD, Registrar,  
Columbia University,  
Washington, D. C.

# STUDENTS IN DEPARTMENT OF JURISPRUDENCE AND DIPLOMACY.

## Candidates for the Degree of Master of Laws.

Name.	Legal address.	City address.
Cowhick, Oscar Glenn.....	Wyo....	1224 I Street.
Denniston, Frederick W.....	Pa.....	Department of Interior.
LL. B., Columbian University.		
Engel, Richard Drum.....	Mass....	1634 3d Street..
LL. B., Columbian University.		
Foster, Isaac Cephas.....	Va.....	428½ M Street.
LL. B., Columbian University.		
Geissler, Arthur H.....	Okl Ty.	The Raleigh.
Gow, Bernard Arthur.....	Mo.....	1201 5th Street.
LL. B., Missouri State University.		
Jedlan, John Wenceslaus.....	Ill.....	The Brunswick.
LL. B., Illinois College of Law.		
LL. B., University of Michigan.		
Jenks, Royal Granville.....	La.....	951 Massachusetts Ave.
Hutchison, Edmund Archus.....	Texas..	45 M Street.
LL. B., Georgetown University.		
Keneipp, Hugh.....	Ill.....	136 D Street, S. E.
LL. B., University of Michigan.		
Keyser, Paul Victor.....	Iowa....	208 F Street.
LL. B., Columbian University.		
Larash, William Leonard.....	Pa.....	1206 T Street.
LL. B., Columbian University.		
Linkins, William Henry.....	D. C....	1923 G Street.
LL. B., Columbian University.		
Littlepage, Thomas Price... ..	Ind....	Bureau of Corporations.
LL. B., Columbian University.		
Llovet, Salvador Vilella.....	Porto Rico,	617 13th Street.
LL. B., Baltimore University		
Mace, Lawson Nicholas.....	Ind.....	1012 12th Street.
LL. B., Indiana Law School of University of Indianapolis.		
McElroy, Robert J. P.....	Pa.....	1206 T Street.
Matthews, Dan... ..	W. Va..	1108 16th Street.
LL. B., Columbian University.		
Merrill, Thomas Sherlock.....	D. C....	416 T Street.
LL. B., Columbian University.		
Pack, Harold Jack.....	Pa.....	The Orme.
LL. B., Columbian University.		

Name.	Legal address.	City address.
Mitchell, Andrew S.....	Ohio....	921 8th Street.
Montgomery, William Perry.....	Mo.....	1825 S Street.
LL. B., LL. M., National University.		
Oberlin, Paca.....	Va.....	1238 5th Street.
LL. B., Columbian University.		
O'Bryon, George Elmer.....	N. Y....	324 B Street, S. E.
A. B., LL. B., Columbian University.		
Raines, Thomas Raleigh.....	Miss....	1234 I Street.
LL. M., National University.		
Sabin, Edwin Milburn.....	Wis....	143 N. C. Avenue, S. E.
LL. B., Columbian University.		
Sammons, Thomas.....	Wash...	32 B Street, N. E.
Saxton, Howard.....	Neb....	718 12th Street.
LL. B., University of Nebraska.		
Thompson, Albert Lorenzo.....	Iowa...	143 N. C. Avenue, S. E.
LL. B., Columbian University.		
Thompson, Augustine Bernard..	Ky.....	519 2d Street.
A. B., Bardstown M. and F. Institute.		
A. B., A. M., St. Mary's College.		
LL. B., Catholic University of America.		
Thomas, Henry Green.....	Va.....	1025 8th Street.
LL. B., Columbian University.		
Waterman, Jason.....	Mich...	64½ Bates Street.
LL. B., Columbian University.		
Watson, Harry Lee.....	N. J....	1123 11th Street.
A. B., Brown University.		
LL. B., Columbian University.		
Wilson, Louis Clarence.....	D. C....	1324 S Street.
LL. B., Columbian University.		

*Candidates for the Degree of Master of Diplomacy.*

Baxter, John Kirkman.....	Mass....	U. S. Civil Service Com.
A. B., Harvard University.		
Bryan, Frederick Carlos.....	Ohio...	700 14th Street.
A. B., Western Reserve.		
LL. B., Cincinnati College.		
LL. M., Columbian University.		
Caldwell, Winfield Scott.....	N. Y....	1338 R Street.
Calhoun, Clarence Crittenden.....	Ky.....	Home Life Building.
Castelli, Enrico.....	D. C....	1518 K Street.
A. B., B. Sc., M. D., Italy.		
L. M., Dublin.		
Dearing, Fred Morris.....	Mo.....	2011 Q Street.
Dodge, Arthur J.....	Okl. Ty.	1403 F Street.
LL. B., Columbian University.		
LL. M., National University.		

*Department of Jurisprudence and Diplomacy.*

199

Name.	Legal address.	City address.
Dorman, James Hervey, Jr. ....	Ky.....	State Department.
LL. B., Centre College, Kentucky LL. M., Columbian University.		
Farley, John William.....	Tenn...	1931 K Street.
LL. B., Vanderbilt University LL. M., Columbian University.		
Fong-Hoh, Franklin .....	China ..	1813 13th Street.
Gassett, Percival.....	Mass....	State Department.
Gaw, Albert Cornelius.....	Minn...	Kendall Green.
A. B., A. M., William Jewell College A. M., Gallaudet College.		
Heimbeck, Adolph J.....	Ill.....	Treasury Department.
LL. B., Iowa State University. LL. M., Illinois College of Law.		
Herrick, Samuel .....	Pa.....	622 F Street.
LL. B., LL. M., D. C. L., Columbian University.		
Plumacher, Blas Guillermo .....	Venezuela,	1629 Howard Avenue.
Taniguchi, Fumihiko.....	Japan...	15 E Street.
Walter, Luther Mason.....	Ky.....	Inter. Commerce Com.
B. E., National Normal University. LL. B., LL. M., D. C. L., Columbian University.		

*Candidates for the Doctorate in Civil Law.*

Bischoff, Ernest William .....	N.Y....	
LL. B., Cornell University.		
FitzGerald, William Sinton.....	Ohio ...	1416 S Street.
LL. B., LL. M., Columbian University.		
Loughran, Patrick Henry.....	N.Y....	15 9th Street, S. E.
LL. B., Georgetown University. LL. M., Columbian University.		
Shibley, George Henry.....	N.Y....	53 Bliss Building.

*Review Students.*

Clark, Charles C.....	Pa.....	Dept. of Agriculture.
LL. B., Philadelphia Law School. LL. M., D. C. L., Columbian University.		
Franklin, Wallace Conklin .....	Ky.....	1221 Mass. Avenue, S. E.
LL. B., Southern Normal, Bowling Green, Ky. LL. B., LL. M., Columbian University.		
Hawley, Everett M.....	D. C....	736 12th Street.
LL. M., D. C. L., Columbian University.		
Tharin, Frank .....	S. C....	1817 9th Street.
LL. B., LL. M., D. C. L., Columbian Uni- versity.		

*Special Students.*

Bailey, Mrs. Emma Reba.....	Ga.....	The Logan.
LL. B., LL. M., Washington College of Law.		
LL. M., D. C. L., Columbia University.		
Briggs, William .....	D. C.....	233 Penna. Avenue, S. E.
LL. M., National University.		
Dixon, Miss George Eleanor....	Md.....	1114 M Street.
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Pitcher, Eugene H.....	Ill.....	519 11th Street.
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Smith, Harrison Timothy Clark....	N. Y ...	1207 N Street.
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*Recapitulation.*

Candidates for the Degree of Master of Laws .....	34
Candidates for the Degree of Master of Diplomacy.....	17
Candidates for the Doctorate in Civil Law.....	4
Review Students .....	4
Special Students.....	16
Total .....	75

## Doctors of Philosophy.

During the years 1894 to 1903, inclusive, the University has conferred the degree of Doctor of Philosophy, after examination and the presentation and public defense of a thesis, upon the following persons:

1894.

Edward Farquhar, (Greek)  
*Thesis*: Elements of Unity in the Homeric Poems. (Conservative Review, vol. iii, June-September, 1900.)

Walter Scott Harshman, (Theoretical Astronomy)  
M. S., 1892, Columbia University.  
*Thesis*: Investigation of the Motion of the Pericentre of Deimos. (Astronomical Journal, Boston, vol. xiv, pp. 145-148, 1894.)

Professor Frank Hall Knowlton, (Botany)  
B. S., 1884; M. S., 1887, Middlebury.  
*Thesis*: The Flora of the Laramie Group and Allied Formations. (Not published.)

Claude Augustus Oscar Rosell, (Chemistry)  
M. A., 1881, University of Pennsylvania; L.L. B., 1886, Georgetown University.  
*Thesis*: Investigation of the Properties of Ferric Acid. (J. Am. Chem. Soc., vol. xvii, pp. 760-769, 1895.)

1895.

George Wesley Hamner, (History)  
B. A., 1882; M. A., 1885, Hiwassee College; L.L. B., 1885, University of Alabama;  
L.L. M., 1886, Georgetown University.  
*Thesis*: Researches upon the Government of the Creek Indians. (Not published.)

1896.

Edward Clarke Hudson, (Greek)  
B. A., 1884; M. A., 1894, Hiwassee College; M. A., 1894, Columbia University.  
*Thesis*: Investigation into the Use of the Genitive Case in Greek. (Not published.)

Rev. James Stephen Lemon, (Psycho-physics)  
B. A., 1864; M. A., 1867, Wesleyan University, Middletown, Conn.  
*Thesis*: The Skin Considered as an Organ of Sensation. (Published separately, 1898, 70 pp.)

1897.

Professor Charles Arthur Hollick, (Palæobotany)  
Ph. D., 1879, Columbia College.  
*Thesis*: Palæobotany of the Yellow Gravel at Bridgeton, N. J. (Not published.)

John Scott Johnson, (Philosophy)  
B. S., 1891; M. A., 1894, Columbia University.  
*Thesis*: The Influence of French Thought on the Formation of the Constitution of the United States. (Not published.)

- Timothy William Stanton, (Paleontology)  
 B. S., 1883; M. S., 1895, University of Colorado.  
*Thesis*: A Comparative Study of the Lower Cretaceous Formations and Faunas of the United States. (Jour. of Geology, pp. 1-49, September-October, 1897.)
- 1898.
- Cabell Whitehead, (Chemistry)  
 B. M., 1885, Lehigh University; M. S., 1895, Columbia University.  
*Thesis*: A Study of the Tellurides; Their Formation and Chemical Properties. (Not published.)
- 1900.
- Eugene Byrnes, (Physical Chemistry)  
 B. A., 1884, Michigan University; LL. B., 1887; LL. M., 1888, Columbia University.  
*Thesis*: Experiments on the Direct Conversion of the Energy of Carbon into Electrical Energy. (Not published.)
- Rev. Benjamin Alfred Dumm, (Philosophy)  
 B. A., 1886; M. A., 1889, Western Maryland College.  
*Thesis*: The Concept of Self in the Analysis of Experience. (Not published.)
- Professor Charles Russell Ely, (Chemistry)  
 A. B., 1891; A. M., 1897, Yale College.  
*Thesis*: Investigation of the Phenomenon of Deliquescence and the Capacity of Salts to Attract Water Vapor. (Not published.)
- Ernestine Fireman, (Chemistry)  
 M. S., 1898, Columbia University.  
*Thesis*: The Action of Phosphonium Iodide on Tetra and Penta Chlorides. (Am. Chem. Jour., 30, 116-133, 1903.)
- Charles Moore, (American History)  
 A. B., 1878, Harvard; M. A., 1898, Columbia University.  
*Thesis*: The Northwest under Three Flags. (Published separately by Harper & Bros., New York, 1900, 402 pp.)
- 1901.
- William Hamilton, (American History)  
 B. A., 1891, Moravian College, Pennsylvania; M. A., 1894, Columbia University.  
*Thesis*: The Expansion of Russia to the Eastward. (Not published.)
- Chohei Shirasu, (Economics)  
 Graduate, 1893, Doshisha University, Japan; A. M., 1899, Yale University.  
*Thesis*: The Development of Commerce in Japan and its Effect on Civilization. (Summary of Commerce and Finance for December, 1901, Bureau of Statistics, U. S. Treasury Department, pages 2227-2315.)
- 1902.
- Rev. Frank Leighton Day, (Anthropology)  
 B. A., 1891, M. A., 1896, Roanoke College; B. D., 1895, Vanderbilt University.  
*Thesis*: Did the Semites Pass through a Totem Stage? (Not published.)
- Nevil Mouroe Hopkins, (Chemistry)  
 B. S., 1899, M. S., 1900, Columbia University.  
*Thesis*: Some Experiments on Electrolytic Conductivity with Reference to the Ionic Theory. (Not published.)

1903.

Edwin Allston Hill,

(Chemistry)

A. B., A. M., Yale University; M. S., Columbian University.

*Thesis*: The Constitution of Certain Halogen Oxy-acids as inferred from Thermo-Chemical Data. (Not published.)

William Mather Lamson,

(Architecture)

B. S., C. E., Columbian University.

*Thesis*: Iron and Steel Domes. (Not published.)

Thomas Malcolm Price.

(Biochemistry)

B. S., Maryland Agricultural College; M. S., Columbian University.

*Thesis*: The Influence of Varying Strength Solutions of Formaldehyde on some of the Enzymes of Animal Origin.

Harriet Richardson,

(Zoölogy)

A. B., A. M., Vassar College.

*Thesis*: Contributions to the Natural History of the Isopoda. (Proc. U. S. Nat. Museum, 27, 1-89, 1904, and Bull. U. S. Fish Com., pp. 47-54, Sept. 17, 1903.)

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# INDEX.

	Page		Page
Administration and instruction	x	Department of Dentistry	143
Admission	14, 113, 144, 187, 189	admission	143
to District bar	199	advanced standing	144
to special courses	25, 133, 151	board	144
	169, 195	building	157
Advanced degrees	25, 78, 142, 186	courses in arts and sciences	151
Advanced standing	25	courses of instruction	145
Advantages, educational	1	faculty	143
Aid to students	83, 132	fees	151
Alumni association	18	graduation	180
Anatomy	119	location	152
dental	147	prizes	151
Archaeology, classical	27	students	152
Architecture	28, 75	text-books	149
Arts and sciences	1	tuition	151
Astronomy	30	Department of Jurisprudence and Di-	
Astro physics	32	plomacy	153
Athletics	204	admission	186
Auditors	28	assignments	187
Bachelor of Arts	14, 65	board of visitors	viii
Bachelor of Laws	165	courses in arts and sciences	195
Bachelor of science	14, 71	courses of instruction	180
Bacteriology	122, 148	degrees	195
Bio-chemistry	118	examinations	195
Board	vii	faculty	183
Board of Visitors	viii	fees	196
Botany	25, 33	graduate course	195
Calendar	8	historical	184
Chemistry	22, 35, 74, 117, 146	languages	186
agriculture	37	lectures	180, 193
dental	146	library	190
medical	147	method of instruction	149
Civil Engineering	5, 72	objects	195
Classical Club	40	oratory	194
Classical course	68	prize	192
Classical languages	38	reading-room	198
philology	39	students	197
Clinics	124, 128	theses	198
Commencement	85	tuition	199
Davis prize speaking	87	withdrawal	199
Degrees	67, 78, 126, 187, 195	Department of Law	155
Dentistry, Department of	141	admission	157
Dentistry, operative	146	admission to bar	166
prosthetic	146	building	157
Department of Arts and Sciences	9	courses in arts and sciences	165
admission	12	courses of instruction	159
chapel	56	court of appeals	156
courses in medicine and law	66	degrees	165
courses of instruction	26	examinations	168
dismissal	98	faculty	155
Enosinian Society	87	fees	167
examinations	85	graduate course	163
faculty	9	historical	157
fees	88	lecture hall	157
law courses	66	library	166
library	86	morning conferences	163, 161
location	12	oratory	164
medical courses	66	patent law	164
prizes	82	prizes	168
prize speaking	87	reading-room	166
rooms and board	80	students	168
schedule	76	tuition	167
scholarships	78	withdrawal	167
students	90	Department of Medicine	168
theses	81	admission	113
tuition	88	advanced standing	113
worship	86	board	133

	Page		Page
Department of Medicine:		Latin.....	16
buildings.....	113	Law, Department of.....	155
clinics.....	124, 128	Library science.....	53
courses in arts and sciences.....	133	Library.....	86, 100
courses of instruction.....	115	Literary society.....	87
degrees.....	120	Logic.....	59
demonstrators.....	109	Master of arts.....	163, 164, 167
diploma.....	128	Master of laws.....	79
dispensary staff.....	111	Master of science.....	119, 147
examination.....	128	Materia medica.....	70
faculty.....	108	Mathematical-physical course.....	20, 54
fees.....	133	Mathematics.....	27
graduation.....	126	applied.....	56, 74
hospital.....	113, 128	Mechanical engineering.....	124
hospital staff.....	111	Medical jurisprudence.....	108
laboratory.....	133	Medicine, Department of.....	118
location.....	131	Medicine, Theory and practice of.....	123
prizes.....	132	Mental diseases.....	140
scholarships.....	134	Metallurgy.....	58
students.....	124	Meteorology.....	123
text-books.....	133	Microscopy.....	45
tuition.....	144	Mineralogy.....	120
Department of Public Health.....	120	Minor surgery.....	69
Dermatology.....	183	Modern language course.....	121
Diplomacy, Department of.....	205	Nervous diseases.....	117
Directory.....	186, 190	Neurology.....	116
Doctor of Civil Law.....	80, 201	Obstetrics.....	140
Doctor of philosophy.....	24, 48	Operative dentistry.....	121
Drawing.....	41	Ophthalmology.....	164
Economics.....	1	Oratory.....	148
Educational advantages.....	41, 73	Oral surgery.....	121
Electrical engineering.....	80	Orthopedic surgery.....	121
Engineering degrees.....	15, 43	Otology.....	164
English.....	87	Patent law.....	121, 122
Enosman Society.....	14	Pathology.....	122
Entrance examinations.....	59	dental.....	121
Ethics.....	15, 85	surgical.....	120
Examinations.....	164	Pediatrics.....	59
Expression and oratory.....	88, 133, 151	Philosophy.....	21, 61
Fees.....	18	Physics.....	24
French.....	72	Physiography.....	118, 147
General course.....	45	Physiology.....	52
Geology.....	19, 46	Political science.....	78, 85
German.....	vii	Powell scholarships.....	x
Governing Board.....	48	President's Council.....	82, 131, 151, 165
Graphics.....	17	Prizes.....	140
Greek.....	71	Prosthetic dentistry.....	59
Group electives.....	116, 120	Psychology.....	142
Gynecology.....	25, 78, 142, 186	Public health.....	86
Higher degrees.....	84, 132	Public speaking.....	62
High schools.....	1	Public worship.....	76
High-school system.....	123, 148	Romance languages.....	83, 132
Histology.....	70	Schedule.....	19, 64
Historical-political course.....	20, 50	Scholarships.....	115
History.....	51	Spanish.....	115, 120
American.....	51	Surgery.....	121
English.....	48	minor.....	148
European.....	50	orthopedic.....	105
medieval.....	50	oral.....	100
modern.....	128	Teachers' courses.....	119, 147
Hospital, University.....	105, 121	students.....	81
Hygiene.....	65	Therapeutics.....	117
Italian.....	183	Theses.....	vii
Jurisprudence, Comparative.....	124	Toxicology.....	viii
medical.....		Trustees.....	204
Laboratory work:		committees.....	xi
chemistry.....	35	University Athletics.....	26
dentistry.....	150	University Council.....	1
electrical engineering.....	86	University subjects.....	86
mechanical engineering.....	86	Washington, Educational advantages	23, 65
medicine.....	124	of.....	
physics.....	62	Worship.....	
Language and literature.....	43	Zoology.....	
Laryngology.....	121		

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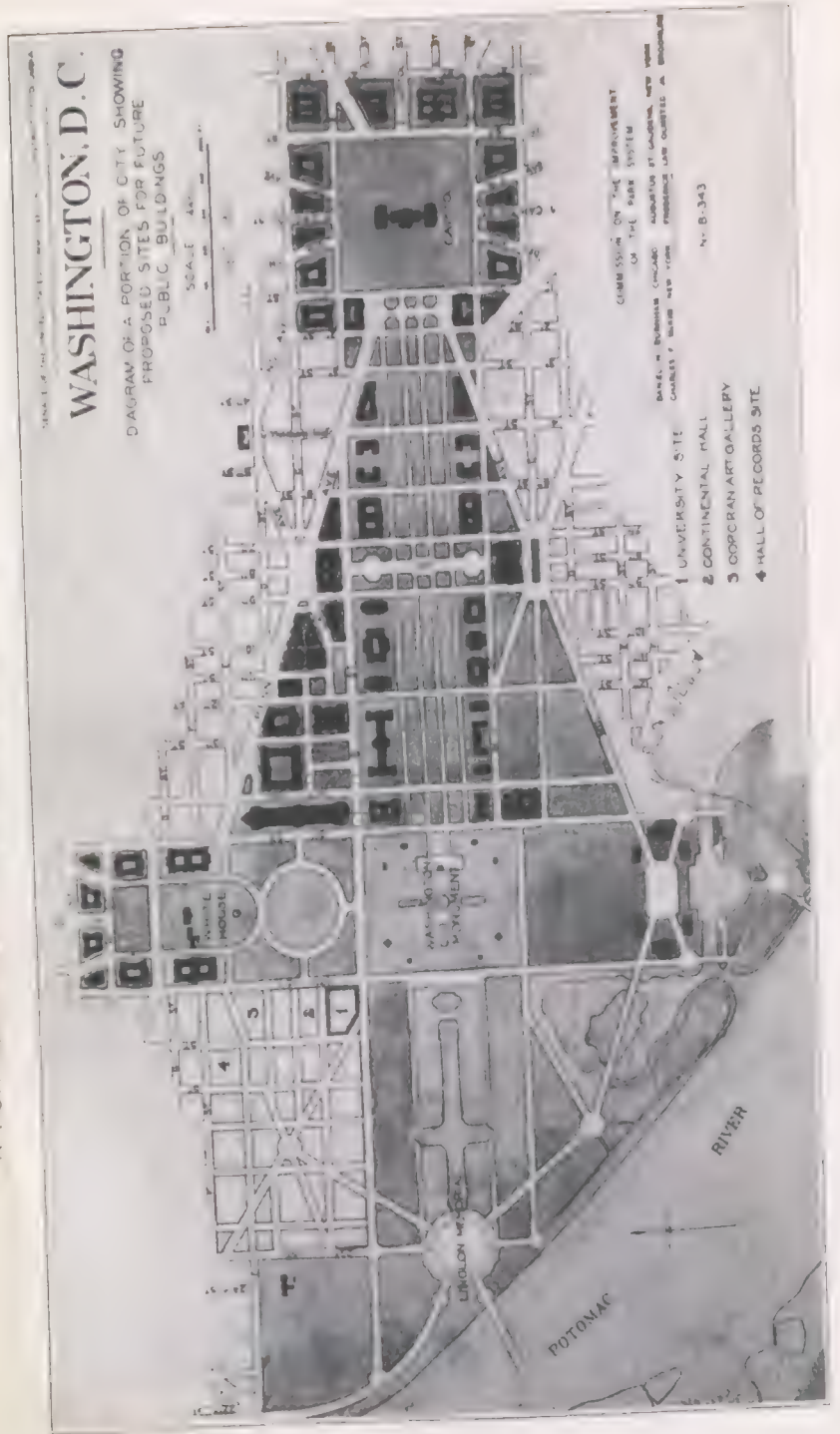


Entered May 2, 1903, at Washington, D. C., as Second Class Matter under  
Act of Congress of July 16, 1894.





A PORTION OF CITY PLAN SHOWING NEW UNIVERSITY SITE (No. 1)



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*Nominations*: Greene, Woodward, Porter, Gallinger, Bell.  
*Department of Arts and Sciences*: Noyes, Gallaudet, Macfarland.  
*Department of Medicine and Hospital*: Richardson, Larner, Edson.  
*Department of Dentistry*: Shallenberger, Richardson, Gallinger.  
*Department of Law*: Mattingly, Larner, Montague.  
*Department of Jurisprudence*: MacVeagh, Mattingly, Newlands.  
*Auditing Committee*: Chambers, Parker, Shallenberger.  
*Endowment*: Gallaudet, Levering, Woodward, Greene, MacVeagh, Parker, Noyes, Bell, Newlands, Chambers, Porter, Gallinger, Macfarland.

## ALUMNI ASSOCIATION.

An address list of all graduates is kept at the University by the Secretary of the General Alumni Association. All Alumni are requested to send to him notices of changes in address and any other items of information in reference to graduates or former students of the University.

### THE GENERAL ASSOCIATION.

OFFICERS, 1904.

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*Vice-Presidents*.

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JOHN JOY EDSON.

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*Secretary*, HOWARD L. HODGKINS.

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*President*, CHARLES F. MUNDAY.

*Vice-President*, WILLIS B. HERR.

*Secretary-Treasurer*, WILLIAM E. MCCLURE,  
Dexter Horton Bank Building, Seattle, Washington.

## COLUMBIAN UNIVERSITY.

**A**T a meeting of the Board of Trustees of Columbian University on June 8, 1904, a resolution changing the name of the University to that of The George Washington University was unanimously adopted. The name was on the 20th day of June approved by the Secretary of the Interior and the Commissioner of Education, and on the 22d day of June it was filed with the Recorder of Deeds. This action was taken under a recent act of Congress approved January 23, 1904. The new name will be assumed September first.

On the same day the certificate to change the name was filed, a certificate of organization was issued under the general laws of the District of Columbia, organizing the Columbian College. This corporation was formed by direction of the Board of Trustees of the University for the purpose of preserving and continuing the old name, Columbian College. A Board of Trustees was selected for the College by the University Board, consisting of Samuel H. Greene, D. D., LL. D., Edward M. Gallaudet, LL. D., Samuel W. Woodward, Eugene Levering, Theodore W. Noyes, LL. M., John B. Larnier, LL. D., Thomas R. Jones, LL. B., William S. Shallenberger, A. M., and David Abbot Chambers, A. M.

The College will have charge of the undergraduate work under the general direction of the Board of Trustees of the University; it will in fact be the undergraduate department of the University.

**The George Washington University.**—In December, 1897, a body of patriotic women, representing different parts of the United States, met in the city of Washington, and the result of their conference was the incorporation, in September, 1898, of the George Washington Memorial Association. The objects of the Association were stated to be "to advance and secure the establishment in the city of Washington of an University

for the purposes and with the objects substantially as set forth in and by the last will of George Washington, the first President of the United States, and to increase the opportunities for higher education of the youth of the United States."

The membership of the Association increased, and considerable sums of money were given and subscribed by educated and patriotic persons throughout the country to a permanent building fund held in trust by the Association for a proposed memorial building, the subscription and cash in hand amounting to about fifty thousand dollars.

This Association in its inception had in view the establishment, by congressional action, of a university having an organic relation with the Federal Government. It became apparent that the attempts to establish such a university could not succeed. A movement was then started by the Washington Academy of Sciences to establish educational facilities for research and graduate work. This resulted in the incorporation of the Washington Memorial Institution. The Institution had before it the work of general research and the utilization of the facilities in the departments at Washington for graduate students in colleges and universities. The establishment, in 1902, of the Carnegie Institution provided for the first object in view by the Memorial Institution—that of research work. The second object, an institution for graduate students, remained to be adequately provided for.

In the fall of 1903 conferences were held between the representatives of the Washington Memorial Institution and the Columbian University looking to suitable provision for this work. The University proposed to have its charter changed, making the institution non-denominational, electing to membership upon its Board of Trustees representatives from the Memorial Institution, enlarging its courses and corps of professors and instructors to carry on the proposed graduate work in Washington. At the same time negotiations were entered upon with the George Washington Memorial Association looking to the fulfillment of its objects by the building of a George Washington Memorial to be used as an administration building for the University under this reorganization. These con-

ferences came to a very satisfactory conclusion, and a bill was introduced in Congress making the University non-denominational, and also giving to the Board of Trustees power to change its name. This bill was passed by Congress and was approved by the President on January 23, 1904.

At a meeting of the Executive Committee of the George Washington Memorial Association in April, 1904, after due consideration of the plans of the University and its reorganization, the Executive Committee made a proposition in writing to the University, suggesting that the Association would cooperate upon condition that the University would take the name "The George Washington University."

On April 30, 1904, a meeting of the General Alumni Association of Columbian University was held in Washington, at which a statement was made by the President of the University concerning the proposed change of name. Addresses were made by Assistant Attorney General Campbell, Director Walcott, Mr. William Bruce King, president of the Alumni; Rev. Dr. S. H. Greene, Dr. A. F. A. King, and Senator Newlands, after which the following preamble and resolutions were unanimously adopted:

WHEREAS the Alumni of Columbian University assembled at Washington this 30th day of April, 1904, have listened to the proposed plan for the change of name and the organization of an auxiliary corporation to be known as Columbian College, and the proposition of the George Washington Memorial Association to build an administration building upon the new site, to be known as the George Washington Memorial Hall, and to be used by Columbian University, upon condition that the name of the University be changed to The George Washington University: Therefore,

*Resolved*, That we approve said plans and recommend the acceptance of said proposition by the Board of Trustees.

*Resolved*, That the President of this Association convey to the George Washington Memorial Association our hearty appreciation of their interest in and cooperation with the plan to make the University national in its aims and work.

On May 2, 1904, at a meeting of the Board of Trustees of the University, the suggestion of the Executive Committee of the Memorial Association was accepted, and certain "Points

of Agreement" were formulated and adopted by the Trustees and forwarded to the President of the Memorial Association. These points of agreement were submitted to the Trustees of the George Washington Memorial Association at its semi-annual meeting on May 5, 1904, and were duly ratified. By this action the agreement became operative. The points of agreement are as follows:

"First. The George Washington Memorial Association agrees to undertake the raising of sufficient funds, estimated to be \$500,000, to construct the central building in the proposed University group of buildings upon Van Ness Park, the building to be known as the George Washington Memorial; the plans of the building to be approved by the Executive Committees respectively of the Association and the University; the building to be used as the administration building of the University, and the auditorium for lectures, gatherings of an educational character, meetings of international tribunals, and of scientific organizations, under such regulations as the University shall from time to time prescribe. The University shall have charge of the construction, care, and maintenance of said building, and the building shall belong to and be the property of the University.

"Second. The University agrees to change its name in accordance with the provisions of the act of Congress approved January 23, 1904, to The George Washington University, the name to be approved by the Secretary of the Interior and the Commissioner of Education, as provided in said act, the change to go into effect and the name to be used on and after September 1, 1904. This name shall, upon completion of said building, be considered as adopted in perpetuity in pursuance of this agreement between the Association and said University, and shall not thereafter be changed, the adoption in perpetuity being of the essence of this agreement.

"Third. The George Washington Memorial Association shall, upon the acceptance of these terms, by its Board of Trustees, forthwith proceed to complete its auxiliary State organizations, and proceed to secure the necessary subscriptions for said building, and steadily prosecute the same to completion, and in all matters of the presentation of this subject to its local bodies, the University, through its President, will cooperate with the Association."

Columbian University.—By special act approved February 9, 1821, the Congress of the United States incorporated the Columbian College, in the District of Columbia, with broad and comprehensive powers. This was about twenty-two years after Washington's death, but while the matter of his bequest and

his desire for the establishment of an institution of learning in Washington were being discussed and considered, and the reasons assigned by the first President for an institution of learning at the national capital were a potent and perhaps a determining influence for the location in this city of Columbian College. The College was encouraged and patronized by John Quincy Adams, then Secretary of State; William H. Crawford, Secretary of the Treasury; John C. Calhoun, Secretary of War; William Wirt, Attorney General; Return J. Meigs, Postmaster General, as well as by many distinguished citizens throughout the country.

Some of the statements made in the public press at that time regarding the College are as follows:

"We have considered the establishment of the Columbian College in the District of Columbia as an event of great importance and as likely to be of extensive and lasting utility to the best interests of man." "An institution so situated—bringing together young men from various quarters of our wide, extended country, to meet, as it were, on neutral ground—will have a highly important and beneficial effect upon the stability of our Union."—*Editor of the "Patriot."*

James Monroe, who approved the charter, said of it:

"The act of incorporation is well digested, looks to the proper objects, and grants the powers well adapted to their attainment. The establishment of the institution within the Federal district, in the presence of Congress, and of all the Departments of the Government, will secure to the young men who may be interested in it many important advantages, among which the opportunity which it will afford them of hearing the debates in Congress and in the Supreme Court on important subjects must be obvious to all. With the sepeculiar advantages, this institution, if it receives hereafter the proper encouragement, cannot fail to be eminently useful to the nation. Under this impression, I trust that such encouragement will not be withheld from it."

In the first class of 1822 there were students from Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Maryland, Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Tennessee, Mississippi, Louisiana, Indiana, Kentucky, and Ohio—21 of the 24 States and 1 Territory—besides the District of Columbia.

At a later period John Quincy Adams became its special friend and patron, assisting it, in its time of need, with a loan of nearly \$20,000 and contributing as a donation \$7,000, while he frequently visited the college to watch its progress. In connection with the College a Medical School and a Law School were established, associating in the educational work some of the most eminent men in the nation.

A public commendation of the institution was made in 1865, as follows:

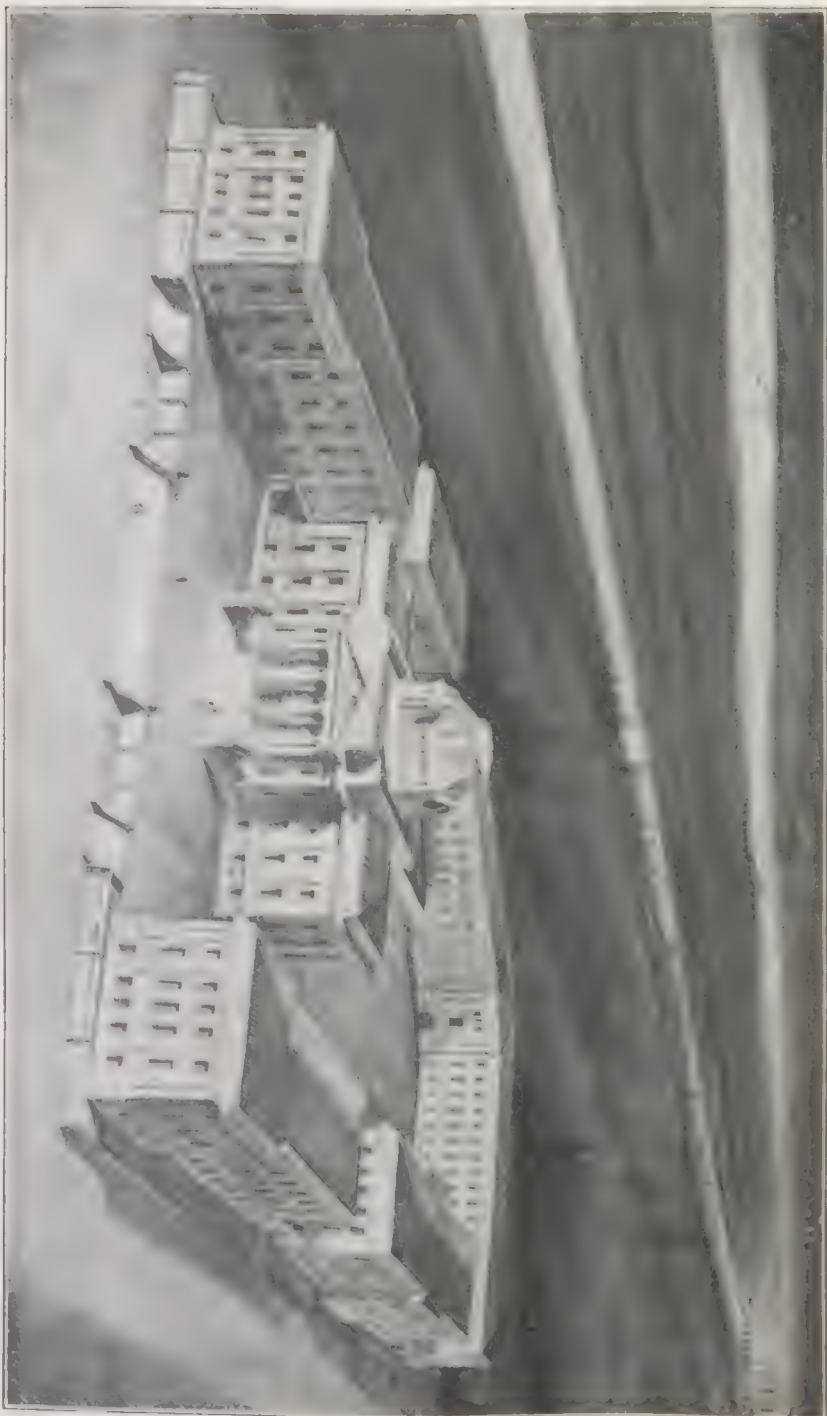
"The undersigned commend the efforts of the Trustees of the Columbian College, Washington, D. C., several of whom are known to them as eminently fitted for their charge, in seeking to render the College in all its departments worthy the demands of its location. They especially commend to any one who may be able to contribute to its advancement the Law School of the College, assured that the facilities of its location and the resort which is now making to it by young men from every section of the country will render it a means of promoting a truly national spirit among its pupils.

"(Signed) S. P. CHASE, *Chief Justice United States.*  
 JAMES S. WAYNE, *Asso. Justice Sup. Court U. S.*  
 IRA HARRIS, *U. S. Senator from New York.*  
 J. R. DOOLITTLE, *U. S. Senator from Wisconsin.*  
 EDWARD COWAN, *U. S. Senator from Pennsylvania.*  
 JAMES GUTHRIE, *U. S. Senator from Kentucky.*  
 REVERDY JOHNSON, *U. S. Senator from Maryland.*"

An appropriation of lands valued at \$25,000 was made by Congress for the College, and President Jackson expressed his approval and the hope that this institution might in time realize the ideals and hopes of Washington.

Mr. William W. Corcoran, the distinguished philanthropist of Washington, was a substantial contributor to the College. He helped to establish the medical and law departments by large gifts, and in 1873 gave \$100,000 "to make the College an University." Congress thereupon amended the charter and gave it the name Columbian University. From that time there has been a steady growth and development of the institution. The University has now a Department of Arts and Sciences, undergraduate and graduate courses, with 452 students; a Department of Medicine, with 306 students; a Department of

TENTATIVE PLAN OF A GROUP OF BUILDINGS ON NEW SITE.



CORCOR  
HALL.

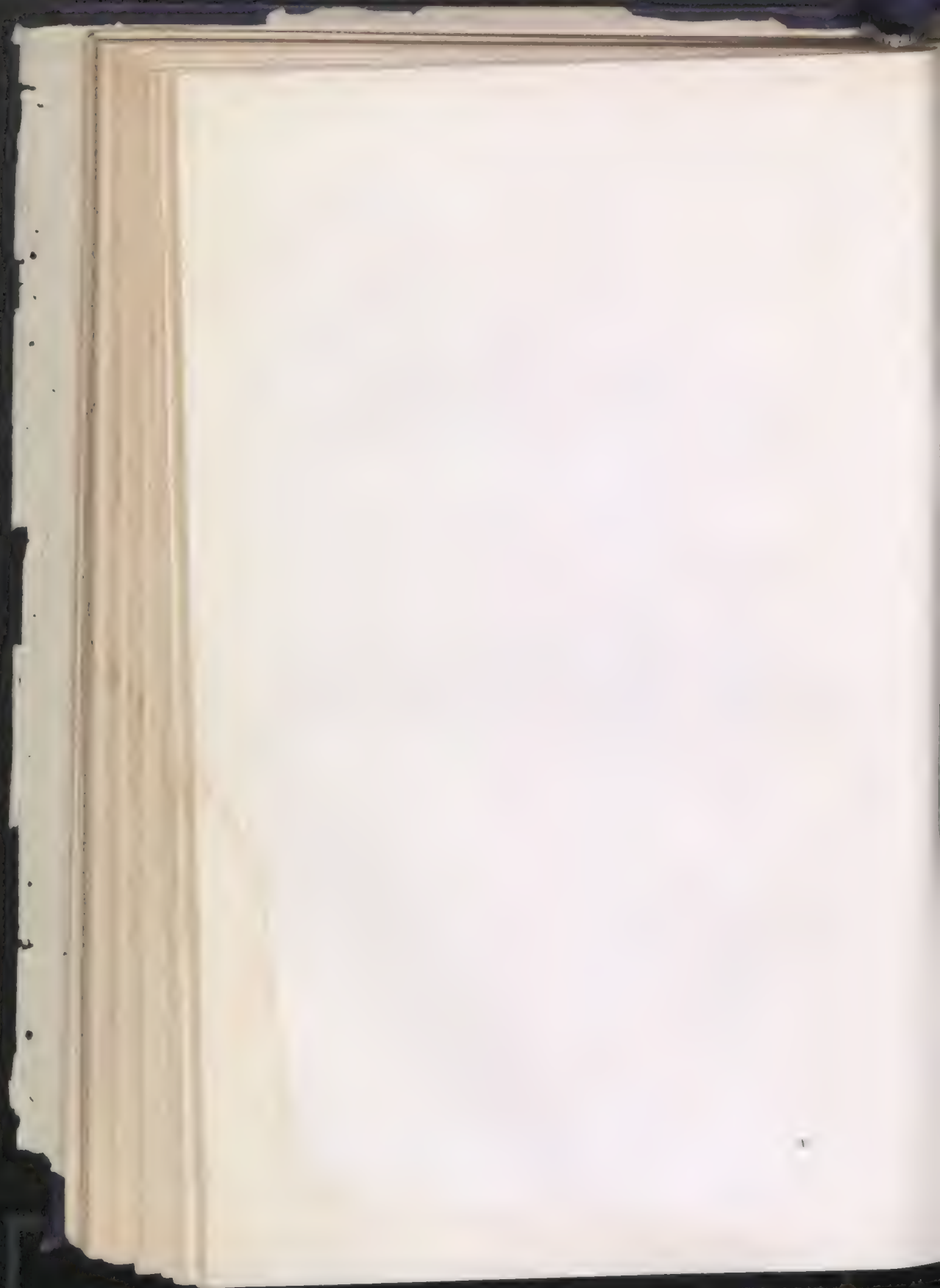
ALLEN HALL.

GYMNASIUM

GEORGE WASHINGTON MEMORIAL

EIGHT DORMITORY HALLS

LIBRARY AND LAW



Dentistry, with 84 students; a Department of Law, with 469 students, a Department of Jurisprudence and Diplomacy, with 75 students, and Courses for Teachers, with 59 students. Its officers of administration and instruction number 206, and comprise among them some of the most distinguished men in educational and administrative work in the country. It has graduated 4,560 students, conferring in all 5,693 degrees. From 1821 to 1884 it granted 2,324 degrees to 1,949 students; in the next decade it granted 1,070 degrees to 895 students, and in the last decade to 1903, inclusive, it has granted 2,299 degrees to 1,716 students. The University now has in all departments 1,445 students, and every State in the Union, the Territories, and the District of Columbia are represented in the student body, as well as Hawaii, Philippine Islands, Porto Rico, and Chili, China, Costa Rica, Cuba, Germany, Japan, Peru, and Venezuela.

By the agreement between the George Washington Memorial Association and the University the name is changed to The George Washington University, to go into effect September 1, 1904.

By further action of the Board of Trustees of the University, there has been formed an auxiliary corporation to be known as Columbian College. This corporation is vested with the conduct of the undergraduate work, and closely allied with the University, some of its trustees being members of the University Board of Trustees, its highest official officer being a Dean, and the Dean and professors of the College being members of the University Council. No degrees will be conferred by the College, the undergraduates going up to the University for their examinations and degrees.

It is also proposed by the University to offer this plan of college organization to other groups of persons who are interested in establishing colleges in Washington, with the view to having several colleges conducting undergraduate work connected with the university and allied to it. Under this arrangement the University will conduct purely graduate and professional work, leaving the undergraduate work to the colleges.

In the Department of Arts and Sciences graduate work of the highest order will be carried on under the most approved professors and teachers. It is expected that arrangements may be made with colleges throughout the country by which, upon certificates of graduation from the colleges, the students will be received into the University for all graduate work, assisting the smaller colleges to retain their students for the baccalaureate degrees and giving the students the opportunity to take their graduate degrees from this University. It will also be the policy of the University to enter into reciprocal arrangements with the other great universities by which students will be given the opportunity to take advantage of the facilities in Washington for special work, receiving credit in their own institution for the work done here and taking their degrees from the institution from which they come. This arrangement will also give the students of The George Washington University the opportunity to take special work in other universities, for which they will receive due credit here.

The University has recently purchased a new site, containing about five acres of land, fronting upon the President's Park, immediately south of the White House, and fronting south upon Potomac Park. The Potomac Park and the public grounds immediately around this site and along the Potomac River contain over one thousand acres. This park is being steadily improved by the National Government and will be in time one of the finest parks in the country. These public grounds will give the students of this University the largest opportunity for recreation and athletic sports. On either side of the Mall and within walking distance of the University are the permanent Government buildings, with their libraries and laboratories all open to the student. As the city grows and develops nothing can impair the desirability of this site; on the contrary, its importance and desirability will grow with the increasing number of public buildings around the University. Additional grounds will be needed by the University, and these can easily be acquired at a very reasonable cost as soon as the money for the purchase is provided. A plan showing the loca-

tion of the new University grounds, together with some of the proposed improvements of the park, are herein given. The site of the University is a beautiful one, and its desirability is emphasized by the fact that students can reach all of the great educational facilities of Washington by walking across a pleasant park. Immediately in front of this site stands the Washington Monument, an impressive reminder to the student of the character of Washington, dear to America and honored in all the countries of the world.

This University is completely organized, with a long record and a large body of alumni, national in its aims and purposes, and thoroughly qualified under the present arrangement to carry out and realize the objects that have been in the minds of many patriotic men and women. Its charter dates almost back to Washington's day; its site is near the one selected by Washington; its aims are broad and national; and it seems to meet in a peculiar way all the plans and make possible all the ideals of George Washington regarding an institution in the capital city.

**Washington's Policy of National Education.**—It has been truly said that Washington "had a genius for patriotism." He was dominated by this "passion for one's country." His thought was the union of the whole country. The written Constitution was not sufficient for him. He desired a more perfect union—that union which springs not from written conventions, but the unity of thought and purpose which comes from a uniform interpretation of power, a singleness of purpose. His was a patriotism for the great organic whole. His thought, therefore, was directed to the establishment of those agencies that would bring into actuality this union. A careful reading of his letters and will discloses the reasons why he favored an institution of learning in the federal city. He speaks of a national university established by the Federal Government, but he does not dwell upon this as an important or vital fact. He says that he did not see any other way for the establishment of such an institution, and that was true in his day. Private beneficence upon a large scale for such an

enterprise did not then exist. Clearly what he desired was an institution that would accomplish for the country at large patriotic results which he emphasizes as essential to a more perfect unity of the people. That this institution should be a governmental establishment or one supported and maintained by private endowment was certainly not an important factor. The important factor was an institution that should accomplish to the greatest degree possible the results which he emphasizes in all of his letters. The reasons advanced by the great patriot for the establishment of an educational institution at the national capital may be seen in the following extracts from his writings.

In a letter dated November 27, 1794, written to John Adams, Vice-President, he said :

"That a national university in this country is a thing to be desired, has always been my decided opinion and the appropriation of ground and funds for it in the federal city has long been contemplated and talked of."

And again, in a letter dated January 28, 1795, written from Philadelphia and addressed to the Commissioners of the federal city, he said :

"It has always been a source of serious reflection and sincere regret with me that the youth of the United States should be sent to foreign countries for the purpose of education. Although there are doubtless many under these circumstances who escape the danger of contracting principles unfavorable to republican government, yet we ought to deprecate the hazard attending ardent and susceptible minds from being too strongly and too early prepossessed in favor of other political systems before they are capable of appreciating their own. For this reason I have greatly wished to see a plan adopted by which the arts and sciences and belles-lettres could be taught in their fullest extent, thereby embracing all the advantages of European tuition with the means of acquiring the liberal knowledge which is necessary to qualify our citizens for the exigencies of public as well as private life, and (which with me is a consideration of great magnitude) by assembling the youth from the different parts of this rising republic, contributing through their intercourse and interchange of information to the removal of prejudices which might perhaps sometimes arise from local circumstances.

"The federal city from its centrality and the advantages which in other respects it must have over any other place in the nation ought to be preferred as a proper site for such a university."

Again, in a letter addressed to Thomas Jefferson, dated March 15, 1795, he wrote :

"I had little hesitation in giving the federal city a preference over all other places for the institution, for the following reasons : First, on account of its being the permanent seat of the Government of this Union and where the laws and policy of it must be better understood than in any local part thereof ; secondly, because of its centrality, \* \* \* and lastly, as this seminary is contemplated for the completion of education and study of the sciences, not for boys in their rudiments, it would afford the students an opportunity of attending the debates in Congress and thereby becoming more liberal and better acquainted with the principles of law and government."

Washington, with his "genius for patriotism," sat in his quiet library by the Potomac and wrote into his will these words :

"It has been my ardent wish to see a plan devised, on a liberal scale, which would have a tendency to spread systematic ideas through all parts of this rising empire, thereby to do away local attachments and State prejudices, as far as the nature of things would, or indeed ought to admit, from our national councils. Looking anxiously forward to the accomplishment of so desirable an object as this is (in my estimation), my mind has not been able to contemplate any plan more likely to effect the measure than the establishment of a university in a central part of the United States, to which the youths of fortune and talents from all parts thereof might be sent, for the completion of their education in all the branches of polite literature, in the arts and sciences, in acquiring knowledge in the principles of politics and good government; and, as a matter of infinite importance in my judgment, by associating with each other, and forming friendships in juvenile years, be enabled to free themselves in a proper degree from those local prejudices and habitual jealousies, which have just been mentioned, and which, when carried to excess, are never-failing sources of disquietude to the public mind, and pregnant with mischievous consequences to this country."

In a speech to both Houses of Congress, December 7, 1796, Washington said :

"Amongst the motives to such an institution, the assimilation of the principles, opinions, and manners of our countrymen, by the common education of a portion of our youth from every quarter, well deserves attention. The more homogeneous our citizens can be made in these particulars the greater will be our prospect of permanent union ; and a primary object of such a national institution should be the education of

our youth in the science of government. In a republic what species of knowledge can be equally important, and what duty more pressing on its legislature, than to patronize a plan for communicating it to those who are to be the future guardians of the liberties of the country."

These are not the words of a partisan—they are the words of a patriot, inspired by the broadest patriotism. Washington sought an institution not for the institution's sake; in the federal city not for the federal city's sake; but an institution that should realize for the nation in the highest possible degree that unity of conception of federal power, that broad national charity among all the people that could be engendered only by bringing together at the seat of National Government students from every part of the nation. Here they were to learn the science of State building—a State with absolute sovereignty over those activities which entitle the State to be one in the family of nations. The complex form of our Government, so difficult for many to understand and yet so simple and perfect in its operation when understood, was to be studied from the seat of national power, where the governmental functions of national and international activities are being exercised and local interests subordinated and harmonized to the one great organic whole, to the end that the National Government might stand out before the world perfect and powerful as a great State.

It will be seen, therefore, that it was not a federal university connected with the Government that Washington desired, but an institution of such character and standing as would bring students from every part of the country to the capital city, where they might obtain common conceptions of the National Government; where they might mingle together and have their local prejudices reduced, and go forth into all parts of the country, carrying with them a spirit of broad charity and loyalty to the Union.

But it is said, Can not this education and to some extent this association be acquired in other places throughout the Union where educational institutions exist? Certainly these results will be reached in a greater or less degree in every great

institution. To the extent that the student body is distributed over a large part of our territory, the result will be realized. But it is not too much to claim, for it is easily established by existing statistics, that there is no place in this broad land where there are gathered so many representatives of every part, of every State in the Union, as here in the capital city. Here a man meets men from every county in every State and the representatives of all classes and conditions of men that are important factors in political and social economy.

Political conditions have changed since Washington's day. Party spirit has become dominant in every place to which appointments are made, and it certainly would not comport with the spirit of patriotism that moved Washington that an institution should be in any degree controlled by partisan motives. A university having organic relations with the Government, teaching political science, economics, international law, and diplomacy, would, to a greater or less degree, be influenced in its theories and management by the dominant political party. As patriots we can not afford to have our great educational institutions thus dominated or controlled. They must be free in the highest possible sense to study and teach these great questions. They must gather all the facts bearing upon these great questions, and the conclusions reached should not be partisan, but patriotic; the object not politics, but truth. It is today the view of every man who has studied the question and who is possessed of that broad patriotism which impelled Washington, that an institution founded by private endowment, and especially endowment coming from many people, is the best institution to carry out and attain the great objects which were dominant in the mind of Washington.

Such an institution can be as well equipped and supported as one connected with the government, while it would have that freedom and influence that it could not have under partisan influence. It must be remembered that this institution is not only to teach the science of state building, the great problems of economics, the natural sciences, and all subjects which go to make up a broad, liberal education, but, situated in the

city of Washington, it will exercise an influence upon questions of national policy. It should not stand for any particular policy, nor be suspected of such an attitude, and its faculties should be selected with one object in view—that of securing the ablest and greatest educators. We live in a day of great wealth and of large gifts to educational institutions. The people of the country are generously disposed toward the establishment and maintenance of the best institutions of learning. We can but believe, therefore, that there will be a most generous response to the appeal for the establishment of this University, bearing this illustrious name, situated and organized to secure these results, and securing, through the distribution of its students over the entire country, that "more perfect union" so much desired by Washington and by all patriotic men and women throughout the land.

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#### ALUMNI CO-OPERATION.

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At the annual meeting of the general Alumni Association, held March 19, 1904, President Needham addressed the alumni, stating to them the plans for the development of the University in the erection of a quadrangle of University buildings upon the new site at the foot of Seventeenth Street. These plans received the cordial approval of the alumni, and an important movement was instituted at that time having in view the erection by the alumni of a building for the University, to be known as "Alumni Hall." President Needham spoke of the influence of environment upon education, illustrating his remarks by views of the colleges at Oxford and Cambridge, the two great seats of learning in England, where the influence of surroundings upon education may be studied through the centuries of their development. Of this influence he said: "No one questions today the worth, the strength, and the persistence of that race of men who have been educated in these institutions—men who possess peculiar traits of character that

are not wholly the result of book learning or scientific investigation. At Oxford, if we examine the twenty colleges and halls that make up the University, we shall find certain features constantly repeated, which has had a marked effect in stimulating the student and creating men of broad, healthful ideas, with a knowledge of affairs, and filled them with strong, impulsive ambition for dominion. The large quadrangles, courts, gardens, and meadows connected with these institutions have furnished space in the open air for meditation, and study, and recreation, so essential to a healthy development of the mind, while the relation of the spaces to the buildings in which the educational work is carried on gives to all somewhat of the atmosphere and very much of the influence that pervades the inner sanctuaries of learning. In these open spaces men receive the best influence from nature, while continually under the inspiration and influence of that intellectual activity that abounds in the University. Within the buildings we find the large dining halls and assembly rooms where men come together regularly day after day in that free intercourse that prevails at the dining table and in the club. All topics are subjects of conversation. Religion, politics, classical learning, science, and other topics are here discussed with the freest play of the intellect. Nothing can take the place of these intellectual gymnastics. Men go out from such institutions with learning, and knowledge, and ideas which have been tested in the laboratory of conversation, having a familiarity with public questions and a self-possession and poise that can be obtained in no other way."

President Needham then exhibited to the alumni views of the proposed quadrangle of buildings to be erected by Columbian University. These plans are shown in the accompanying illustration. Describing them, the President said:

"There are three buildings fronting on Seventeenth Street, on the east side of the site. On the west side, to the north, is a large building, to be known as Corcoran Hall, in honor of the late W. W. Corcoran, who gave so generously to the University and whose fund will be used in the construction of that building. This will contain about forty class-rooms, with

many offices for professors and assistant professors. The rooms will be light and airy, of good size, and well adapted for class-room work. To the south, extending from the north line around to the south line on Virginia avenue, is a row of eight dormitory buildings, which will accommodate about 200 students. These dormitories are provided with stairways leading from the court to the fourth floor. At each landing there are two suites, one on either side, each suite consisting of a study, two bed-rooms, two closets, and a bath between the two suites. This same arrangement is repeated through the range of buildings. These will be constructed in separate halls, so that any one desiring to contribute \$20,000 can have the hall named after him, placing over the entrance an enduring memorial of his benefaction.

"On the northeast corner, fronting Seventeenth street and immediately south of the beautiful building soon to be erected by the Daughters of the American Revolution, is the Library Building. This building is about 74 by 158 feet, and is intended to house the Library, the Department of Bibliology and Library Science, and the Department of Law. The building will cost about \$125,000, the necessary books \$25,000, and to endow the Department of Bibliology and Library Science \$150,000. The Board of Trustees at its last meeting authorized the solicitation of \$300,000 for this building and the endowment of this department. The offer is made to name the department and the building after the donor. This is one of the most attractive and finely located buildings in the group. Work upon Continental Hall, immediately across the street to the north, is soon to be commenced, and this building will be an attractive object to all visitors in this city.

"Immediately south of the Library, in the center of the group and forming the setting, is the Administration Building, to be known as the George Washington Memorial. This building has a frontage of about 166 feet, with a depth of 140 feet, and will cost about \$500,000. It will contain a large memorial hall, an auditorium that will seat from 1,000 to 1,200 people, and on either side of Memorial Hall are offices of administration, with four large rooms, varying in size and

seating 50 to 100 people. These rooms will be used, one for the board meetings, one for the faculty meetings, the others for scientific societies, for classes of post-graduate and research students, and for the Department of Jurisprudence and Diplomacy. The principal features of this building will be a 'Memorial Hall' and special facilities for the larger and scientific and research work of the University. South of the Memorial Hall is the building which is to be the social center of university life. It is on the corner, with the park about it, and from its windows we can look out upon the Mall. The main features of this building will be the large dining-room or 'commons,' which is to be 56 by 58 feet, and will furnish seating capacity for about four hundred. This will be a stately room, the ceiling formed by the roof, and the finish to correspond with the size and uses of the room. This will be the main dining-room for the students in dormitories and the banqueting-room for alumni and other large gatherings. To the west is a smaller dining-room, but still a large one, about 32 by 68 feet, with a seating capacity of two hundred and seventy-five. The ceiling of this dining-room will be lower, and over it there will be private chambers for the accommodation of members. To the east, on the main floor, will be a large library and a large reading-room. Over these rooms there will be other smaller rooms for meetings of committees, fraternities, and other student and alumni organizations. The basement floor, which will be above the ground, will be used for offices, cloak-rooms, a large billiard-room, kitchen, etc. This, then, is the building in which the social life of the University is to be found, where friend meets friend, where the intellectual faculties are to have free play, and where that grip upon mind, that poise, is to be acquired so necessary to strenuous life. Both students and graduates of the University are to find here that recreation and social life so essential, as we have observed, in the development of a strong, intellectual man and woman. Alumni gatherings and banquets will be here; meetings and entertainments of our Columbian Women will be in this building; student organizations and fraternities can hold their banquets and dances in

this place. You will observe how beautifully it is adapted to such uses. The main dining-room can be used in the evening for dancing, while the smaller dining-room will furnish ample space for the refreshments, and the library and reading-room will furnish room for receptions and social greetings. The private chambers for members would be eagerly sought for by graduates who come to the city and desire a pleasant stopping place for a few days, and all this gathering of the students and graduates of the University would create an *esprit de corps* and a love for the institution that would be of inestimable value. To erect this building and furnish it as it ought to be built and furnished will cost about \$150,000. When we consider the uses to which the building is to be put, and its desirability as a part of the educational system, its influence upon character, and its benefits to the institution, it seems as though it should be an easy matter for this Association to raise the money, not among themselves alone, but among the alumni and the friends of the institution in this city.

"All these improvements should appeal strongly to every citizen of Washington who is interested in the physical and intellectual development of the city. The president of the Park Commission, speaking of the location and the buildings to be erected thereon, said, 'This is the most prominent point in the park system, and nothing ought to be done that is not done well.' As you look at the map again, with the site in mind, you will see how true this observation is. From every point on the Mall, as you enter the park, or come up from the park, this group of buildings is before the eye. No one can build a memorial anywhere else that will be seen by as many people, nor can money be invested that will bring a greater or a richer result to the cause of education and the intellectual life of this city."

With cordial spirit the alumni entered into the plans of the President and Trustees of the University, and unanimously adopted the following preamble and resolutions providing for active coöperation :

"The Alumni of Columbian University, having assembled in answer to a call of the President of the Alumni Association, have heard with great

interest the statement by the President of the University of the plans for the enlargement of the University work and of the action of the Trustees in support of these plans.

"As a result of the information so brought before them, it is resolved by the Alumni Association of Columbian University and by the other alumni present :

"1. That the enlargement of the opportunities for higher education at the National Capital, one of the most important steps in the national progress of education, a cause first advocated by President Washington, can best be met by the development on a broader plan of the existing facilities furnished by Columbian University.

"2. That the plan of the President for the expansion of the University, as adopted by the Board of Trustees, meet the hearty approval of the Alumni.

"3. That the Alumni deem it proper that they should have the privilege of participating in this great work of extending the usefulness of Columbian University.

"4. That as a mark of their appreciation they accept the invitation of the President and the Trustees to undertake the work of raising funds among themselves and their friends and those whom they can influence for the erection of the proposed new building known upon the plans as the Social Hall, intended to be the center of social interest in University life among the students.

"5. That to this end the President of the Alumni Association is directed to select a committee of five, with power to add to the number, and of which he shall be a member, to undertake the work, in coöperation with the President of the University."

The committee appointed for undertaking the work of raising funds for the erection of a building by the alumni, in co-operation with the President of the University, is constituted as follows: William Bruce King, President of the General Alumni Association; John Joy Edson, William A. De Caindry, John Paul Earnest, and B. H. Warner.

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#### ALUMNI SCHOLARSHIP.

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The Alumni of the University are asked to nominate candidates for a new scholarship founded by the Alumni Association of Columbian University. This is of the annual value of one hundred and twenty-five dollars, and is to be awarded to a

student who enters the Department of Arts and Sciences and takes a regular course leading to the degree of Bachelor of Arts or Bachelor of Science. There are four courses leading to the degree of Bachelor of Arts—the Classical Course, the Modern Language Course, the Historical-Political Course, the Mathematical-Physical Course—and there are six courses leading to the degree of Bachelor of Science—the General Course, the Civil Engineering Course, the Electrical Engineering Course, the Mechanical Engineering Course, the Chemical Course, and the Architectural Course.

The scholarship for the year 1904-05 will be awarded by a Committee of the Alumni Association, and all applications must be filed with the Secretary of the Alumni not later than August first. The scholarship will hold for the entire college course, provided that the record of the student after admission continues satisfactory.

The candidate for the scholarship must submit evidence that he has completed the preparatory work required for admission to the Freshman Class. This evidence may be in the form of a certificate from a High School or other preparatory school, and should specify the subjects studied, the standing attained, the text-books used, and the time given to each subject. Letters from the candidate's teachers and others certifying to his ability, aptitude, and character, and any other evidence that will aid the committee, will be welcomed. The scholastic merit of the candidate will be the most important factor, considered in connection with the question whether without the scholarship the student could obtain a college education.

Detailed information in regard to the entrance requirements and the courses of study offered by the University will be found in the University catalogue, which may be obtained by addressing the Registrar of the University.

Correspondence in regard to the Alumni Scholarship should be addressed to the Secretary of the Alumni, Prof. H. L. Hodgkins, Columbia University, Washington, D. C.

## EIGHTY-THIRD ANNUAL COMMENCEMENT.

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**May 26.** University Week began with an intercollegiate debate between Columbian University and Georgetown University on Thursday evening, at the New National Theater. This debate was the second of a series of three arranged between the two universities. The theater was filled with enthusiastic friends of both institutions. The question debated was: *Resolved*, "That the payment of subsidies by the Government for the encouragement and upbuilding of the American Merchant Marine is expedient." Columbian was represented by Mr. Leslie C. Fuller, of Michigan; Mr. Thomas Price Littlepage, of Indiana, and Mr. Samuel Edelstein, of Wisconsin. The judges of the debate were Hon. Robert J. Tracewell, Comptroller of the Treasury; Hon. Alfred J. Cooley, United States Civil Service Commissioner, and Col. James G. Payne, auditor for the Supreme Court of the District of Columbia. The Columbian team did honor to the University, and were awarded the debate by the judges.

A very pleasant reception was given by the Graduate Club in the University Library on the same evening from 8 to 11 p. m.

**May 27.** A reception was given by the President and Trustees to the graduating classes on Friday evening at Rauscher's. The arrangements were in charge of Professor Swisher. Very many of Washington's most distinguished people honored the occasion with their presence.

**May 28.** Saturday evening the Columbian University Dramatic Club gave an interesting entertainment at the New National Theater, which was much appreciated.

**May 29.** On Sunday occurred the University Procession, and the Baccalaureate Sermon was preached by the Reverend Philip Stafford Moxom, D. D., of Springfield, Massachusetts, at the New National Theater, at 4 p. m. The procession formed at the University Building under the charge of Pro-

fessor Rudd. The graduates, 234 in number, and the President, members of the Board of Trustees, and the Faculties of the University, all in academic dress, marched to the theater, and returned to the University after the sermon. The theater was filled with undergraduates and friends of the University. Doctor Moxom preached from the text, Philippians I, 10, "That ye may approve the things that are excellent," his theme being culture and religion. It was listened to attentively, and was one of the most interesting and instructive baccalaureate sermons ever delivered before the University.

May 30. Monday, at 10 o'clock a. m., occurred the annual doctorate disputation of the Department of Arts and Sciences. The candidates and subjects were:

William Macon Coleman, A. B. 1858, A. M. 1892, University of North Carolina: Thesis, "A Refutation of Mommsen's Theory on Cæsar's Agrarian Policy;" before Hon. Ellis H. Roberts, LL. D., Treasurer of the United States; Professor A. C. McLaughlin, A. M., LL. B., University of Michigan; Edward Farquhar, Ph. D., Professor Hermann Schoenfeld, Ph. D., LL. D., presiding.

Frank Van Vleck, M. E. 1884, Stevens Institute of Technology: Thesis, "Improvements in Ship Construction;" before Naval Constructor David W. Taylor, U. S. N.; Joseph McMakin, Superintendent of Construction, U. S. Light-house Board; H. D. Williams, M. E., Ordnance Engineer, U. S. Navy Department, Adjunct Professor George A. Anthony, B. P., presiding.

Andrew Wilson, B. A. 1886, M. A. 1890, Kansas Normal College; LL. B. 1890, LL. M. 1891, Georgetown University; M. L. 1892, D. C. L. 1893, Yale University: Thesis, "Influence of John Marshall on the Political History of the United States;" before Baron von Speck Sternberg, LL. D., Imperial German Ambassador; Oliver Wendell Holmes, LL. D., Associate Justice of the Supreme Court; Hon. John B. Henderson, LL. D., Professor Charles C. Swisher, Ph. D., presiding.

The thesis of Warren Waverley Phelan, B. A., entitled "An Historical Sketch of the Criminal Law in Louisiana," was presented May 17, at New Orleans, before a Board of Ex-

perts consisting of D. Generes Dufour, Assistant Attorney General; Solomon Wolff, Attorney; Charles Pollard Cockes, formerly Assistant Attorney General, with Professor William Wirt Howe, LL. D., presiding.

At one o'clock a luncheon was served to the participants and invited guests, at which there was very interesting discussion of the methods of testing the attainments of candidates for the degree of Doctor of Philosophy. This discussion was participated in by the distinguished men who served upon the Boards of Experts and who expressed great interest in the work of the University.

Monday evening occurred the commencement of the Department of Medicine and Dentistry. The address was by Professor Harvey Washington Wiley, LL. D., who spoke of the importance of right ideals in the profession of medicine. The address was very instructive and entertaining and was listened to by a large and appreciative audience. There were 52 graduates of the Department of Medicine and 20 graduates of the Department of Dentistry, the largest graduating classes in these departments in the history of the institution.

**May 31.** Tuesday a reception was given by Phi Alpha Chapter of the Chi Omega Sorority in the Library from 4 to 6 in the afternoon.

In the evening occurred the commencement of the Departments of Law, Jurisprudence and Diplomacy. The address was delivered by Hon. Alexander P. Humphrey, of Louisville, Kentucky, his subject being "The Civil War and the Supreme Court." Judge Humphrey followed closely the history of the decisions of the court in reference to questions leading up to and arising out of the Civil War. It was a clear, concise, and excellent presentation of the subject. There were in all 118 graduates; 72 received the degree of Bachelor of Laws, 20 received the degree of Master of Patent Law, 18 the degree of Master of Laws, 7 the degree of Master of Diplomacy, and 1 the degree of Doctor of Civil Law.

**June 1.** Wednesday, at 12 o'clock, occurred the meeting of the Board of Trustees, at which important business relating to

the University was transacted. Two additional Trustees were elected to the Board—Hon. Henry Kirke Porter, a resident of Pittsburg, Pennsylvania, and member of Congress, to fill the vacancy caused by the resignation of Mr. Joseph J. Darlington, and Hon. Francis Griffith Newlands, United States Senator, to fill the vacancy caused by the resignation of Mr. Thomas R. Jones.

The Trustees ordained that there should be a midwinter convocation in February, at which time honorary degrees and degrees in course may be conferred. In view of the change of name, it is probable that this convocation will be held on the 22d of February, the anniversary of the birthday of George Washington.

In the afternoon from four to six the President gave a reception to the Faculties at Stoneleigh Court. A reception was also given by the Columbia Alpha Chapter of the Pi Beta Phi Sorority in the University building.

In the evening the commencement of the Department of Arts and Sciences was held at the New National Theater. This was the largest and most enthusiastic audience that has ever greeted this Department. The platform was filled with graduates, members of the Faculty, and distinguished guests, nearly all of whom were in academic dress. An eloquent address was delivered by President Ira Remsen, LL. D., of Johns Hopkins University. Dr. Remsen spoke with clearness and precision of statement, maintaining that scientific knowledge is beneficial to the human race. Dr. Remsen traced the growth of the pursuit of science and its development. This address gave great satisfaction to all present. The number of candidates who received degrees were as follows: Bachelor of Arts, nine; Bachelor of Science, eight; Bachelor of Science in Architecture, one; Bachelor of Science in Chemistry, four; Bachelor of Science in Civil Engineering, two; Bachelor of Science in Electrical Engineering, one.

The number of candidates for higher degrees were: Civil Engineer, three; Master of Science, three; Master of Arts, nine; Doctor of Philosophy, three.

This being the last year that the name *Columbian* will be used by the University, a number of its former graduates were given honorary degrees, as follows:

Mr. Sanford H. Steele, a graduate of the Law Department in 1871, who has achieved distinction in the practice of law in the city of New York, was given the honorary degree of Master of Laws.

Mr. William Bruce King, a graduate from the College in 1878, and from the Law Department in 1880, a distinguished lawyer in the District of Columbia, and President of the Alumni Association, received the honorary degree of Master of Arts.

Rev. Thomas Smallwood Samson, a graduate from the College in 1864, the Graduate School in 1865, and the Law Department in 1867, an honored clergyman of the Baptist denomination in Germantown, Pennsylvania, received the honorary degree of Doctor of Divinity.

John B. Larner, a graduate of the Law Department in 1879, now a lawyer in high standing at the District bar, a member of the Board of Trustees, Secretary of the University, and Treasurer of the Alumni Association, received the honorary degree of Doctor of Laws.

Fabian Franklin, a graduate of the College in 1869, a distinguished mathematician, editor of the *Baltimore News*, received the honorary degree of Doctor of Laws.

Dr. Albert Vander Veer, a distinguished surgeon and writer, now dean of the Albany Medical College, received the honorary degree of Doctor of Laws.

Rev. Randolph Harrison McKim, graduate of the University of Virginia in 1861, ex-Confederate soldier, eminent clergyman of the Protestant Episcopal Church, author of several important theological works, and since 1889 Rector of Epiphany Church, Washington, was awarded the honorary degree of Doctor of Laws.

**June 2.** Thursday, at 8 p. m., occurred the Class Day exercises of the Senior Class of the Department of Arts and Sciences at University Hall, with a reception by the Senior Class to the Trustees, Faculty, and undergraduates.

The commencement exercises were in charge of Professors Munroe, Hodgkins, Shute, Lewis, and Tucker. This was the most successful commencement in the history of the University. There has been a large increase of about 250 students in all departments, one of the most gratifying being the increase in the Department of Arts and Sciences, which enrolled this year 440 students. There were also three courses offered to the teachers of the Washington public schools, at which 57 were in attendance, making a total of 497 in the Department.

With the hearty support of the alumni and all friends of the University in the city of Washington and throughout the country, there promises to be a large growth for the University under its new name.

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#### FACULTY ANNOUNCEMENTS FOR THE ACADEMIC YEAR 1904-'05.

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In the Department of Medicine the following appointments have been made :

*Dean of the Department of Medicine :* William F. R. Phillips, M. D. Dr. Phillips graduated at the head of his class in the Columbian University Medical School in 1890. He was appointed Prosector of Anatomy and Lecturer on Hygiene in 1892 ; in 1895 he became Professor of Hygiene in the Columbian Medical School. Since 1895 he has been in charge of certain climatological work in the Weather Bureau. He is a member of the Philosophical Society, of the Medical Society, and of the American Climatological Association. Dr. Phillips will give his whole time to the Department of Medicine, and will develop the morning courses of study.

*Professor of Chemistry :* Charles E. Munroe, S. B., Ph. D. Professor Munroe received the degree S. B. (*summa cum laude*), from Harvard University in 1871, and Ph. D. from Columbian University in 1894. He has held the following appointments : Assistant in Chemistry, Harvard University, 1871-1874 ; Professor of Chemistry, United States Naval Academy, 1874-1886 ;

Chemist to Torpedo Corps, U. S. Naval Torpedo Station and War College, 1886-1892; Dean Corcoran Scientific School, Columbia University, 1892-1898; Dean School of Graduate Studies, Columbia University, 1892-1903; Professor of Chemistry, Columbia University, 1892——. Dr. Munroe was Vice-President American Association for the Advancement of Science, 1888; President of the Washington Chemical Society, 1896; President of the American Chemical Society, 1898; Expert Special Agent of the Twelfth U. S. Census in charge of the Chemical Industries of the United States, 1900-1902; he is Fellow of the Chemical Society of London, a member of the German Chemical Society, the Society of Chemical Industries, the U. S. Naval Institute, the American Institute of Mining Engineers, etc.

*Professor of Pathology and Bacteriology:* James Carroll, M. D. Dr. Carroll is Assistant Surgeon in the United States Army, Curator of the Army Medical Museum, and a member of the Society of American Bacteriologists. He has held the position of Associate Professor of Bacteriology and Pathology and Instructor in Clinical Microscopy in the Department of Medicine.

*Professor of Gynecology:* J. Wesley Bovée, M. D. Dr. Bovée is a graduate of the Columbia University Medical School, 1885. He is a member of the Washington Academy of Sciences and of the Medical Society of the District of Columbia. He has held the position of Clinical Professor of Gynecology in the Department of Medicine.

In the Departments of Law, and Jurisprudence and Diplomacy the following appointments have been made:

*Professor of Corporations* in the Department of Law and *Professor of Continental Law* in the Department of Jurisprudence and Diplomacy: Ernest Gustavus Lorenzen, Ph. B., LL. B., J. U. D. Professor Lorenzen received the degree of LL. B. from Cornell University in 1899. In 1899-1900 he studied in Paris at the École de Droit and École Libre des Sciences Politiques. He studied at Heidelberg and Goettingen, receiving the doctor's degree in law (with the highest praise) from Goettingen, 1901. Professor Lorenzen will devote his whole time to the teaching of law. He will teach the Law of Corporations in the Depart-

ment of Law and will give special attention to the jurisprudence of Germany, France, Spain, and Italy in the Department of Jurisprudence.

Four members of the faculties of law are now giving their whole time to the work of these departments.

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#### UNIVERSITY BIBLIOGRAPHY.

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A Bibliography containing titles of the publications of members of the Faculties, Doctors of Philosophy, and Doctors of Civil Law of the University is being prepared under the editorial supervision of Professor Carroll, with the assistance of Professors Munroe, Phillips, and Vance, and will be issued September 1 under the new name of the University.

VOL. III

No. 3

THE  
GEORGE WASHINGTON UNIVERSITY  
BULLETIN

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OCTOBER, 1904

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SCIENTIFIC NUMBER

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### EDITORIAL NOTE

The GEORGE WASHINGTON UNIVERSITY BULLETIN is published four times a year, under the editorial supervision of the Board of University Publications, appointed by the President's Council. It is the purpose of the Council to make the BULLETIN the organ of the educational and scientific activities of the University. The University Register constitutes one number. Others will be devoted to information of special interest to the Alumni and patrons of the University. Scientific numbers will be published from time to time containing contributions from instructors and graduates, and information regarding books, monographs, and papers published by them under other auspices. A supplement to the University Bibliography, issued September 1, will appear annually, containing titles of publications for the current year and complete lists of publications of present and former instructors and graduates not represented in this Bibliography. Instructors and graduates of the University are requested, without further notice, to furnish the Board of University Publications the desired information. Communications may be addressed to the Chairman of the Board.

## CONTENTS.

I. Fundamental Ideas and Conceptions of Jurisprudence. By Charles Willis Needham.....	1
II. The Proper Grade of Diplomatic Representatives. By John W. Foster.....	14
III. The Relations of Technical Chemistry to the Other Sciences. By Charles E. Munroe.....	32
IV. The Progress and Development of Chemistry During the Nineteenth Century. By Frank Wigglesworth Clarke.....	51
V. The Effects of Tropical Climates upon the Teeth of Americans. By J. Hall Lewis.....	76
VI. The Site of Ancient Phalerum. By Mitchell Carroll.....	82
VII. Some Experiments on Electrolytic Conduction with Reference to the Ion Theory. By N. Monroe Hopkins.....	91
University Appointments.....	94
University Miscellanea.....	95

# The George Washington University.

## BULLETIN.

VOL. 3.

OCTOBER, 1904.

No. 3.

### I.

#### FUNDAMENTAL IDEAS AND CONCEPTIONS OF JURISPRUDENCE.\*

BY CHARLES WILLIS NEEDHAM, LL. D.,

President of the University.

The limit of this paper will not permit me to state, certainly not to discuss, the definitions and opinions of many distinguished authors who have written upon this subject. My aim shall be to state and illustrate what seems to me to be the true fundamental ideas and conceptions of what is called jurisprudence.

Like all concepts, the idea conveyed by the word jurisprudence has passed through stages of change and development. To define clearly the present, and may I say the highest, conception, it is necessary to review briefly these changes and thus arrive at a definition of the subject to be discussed.

In its earlier, if not its original use, this word jurisprudence signified simply a knowledge of the laws of a state. Among the Romans it meant the knowledge of the laws recognized, administered, and enforced under the Roman rule. This idea required the student pursuing the subject to learn the rules of human conduct, of rights, of obligations, and of remedies laid down by the juris-consults and enforced by the courts within the Roman dominion. The study of jurisprudence meant the study of the positive, municipal law enforced or enforceable within a given territory. In short, it was the "study of law," using a phrase now in common use and familiar to every mem-

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ber of the profession. This original use of the word marks the beginning of what is termed the systematic study of the laws of a nation—the classification and codification of law.

With the growth of the philosophical spirit and the scientific method in the domain of learning, this original and practical conception of jurisprudence gradually changed. Scholars and writers arose who wanted to know the reasons for these rules of human conduct and the sources of the positive law enforced by the state. The spirit of investigation led to metaphysical discussions as to what the law ought to be, and not a little speculation as to the original source of authority. The philosophical spirit was strong and prevalent; the scientific method was of slower growth. Speculative theology was dominant among the educated classes in the early development of systematic law; its theories, dogmatic rules, and creeds were sacred and therefore above human authority, and by some thought to be above ordinary criticism. All human authority must, it was urged, conform to the letter of the conception and statement in creeds of divine power and divine will. The growth of the state and the increasing complexity of human affairs requiring new rules of conduct, together with a widening spirit of inquiry after truth, led to the discussion and the development of what was termed the law of nature. This phrase was at least less sacred, and opened the field of politics and law to freer discussion, and the human mind began its search after right as disclosed, in some degree at least, by human experience.

Other theories arose which need not be mentioned; speculation was everywhere seeking authority for government and sources of law outside of the human mind and will. These metaphysical studies are interesting as a part of the history and development of the subject, but time will not permit, nor does my aim require, us to review them. It is sufficient and a relief to observe that in the course of human affairs some theologians and many jurists discovered the truth contained in the statement, "The letter killeth, but the spirit maketh alive." Then investigation and search after the spirit of the law—the principle within the rule, a knowledge of right—became the aim and work of some of the most profound writers. Then the scientific method began to develop, and with some to supersede,

the speculative spirit. The principle of a law was sought by a study of the rule, and its rightness determined by its beneficial operation in human society and its harmony with other principles embodied in other rules of conduct. These principles, as they are discovered and stated, form a body of fundamental truth pertaining to the character and operation of positive human law. The principles are not formulated rules of conduct, for they can be stated in a variety of phrases, but they are the essence of all formulated law.

Behind the manifestation of every visible thing there is the conception of it in the human mind. Is it a painting or a statue? If so, it lived in the mind of the artist before his hand ever touched the brush or the chisel. We call this an ideal, and sometimes ideals are spoken of with derision; but ideals are as real and as essential as the things we touch and handle. Within every living organism there is the spirit or unseen force that we call the principle of life. The form remains when the spirit is gone out of it, but there is no longer a living organism. So every rule of conduct expresses more or less accurately a principle—a theory of right—and by this principle or theory the visible or formulated rule must be known and judged. The principle is the source of the rule more or less definitely fixed in the mind or minds that formed the rule, but in a much higher sense, because more clearly understood by the study and consideration of the rule and its operation, the principle becomes the measure or standard by which the rightness or wrongness of the rule is finally determined.

Architecture is a science. There may be speculation as to its origin, but we know as a matter of fact that the science grew out of the study of structures. Man ceased to be a savage when he became a carpenter; he became civilized when he became an architect. The science grew out of a study of many visible subjects, the work of men's hands. It involved the adaptation of things to some need in civilized life, right proportions and some adornment. The conceptions and principles which were the result of this study and comparison came into being; the study and the comparison of things cultured and enriched the mind, and in that unseen and mysterious workshop created new and higher ideals and conceptions, which in time

were manifested in new visible forms. These principles systematized formed a body, and made the science which became the standard by which all structures are judged. Looking at a building, we inquire, Is it good architecturally? That depends upon its adaptation to the uses to which it is to be put; its ability to stand the strains that will come upon it; proper proportions and conformity in all its lines to the beautiful. We measure or determine it by the rules of the science. This same intellectual process is equally true in the domain of formulated law. Is the rule expressed in a given formula adapted to establish and maintain a right or to cure an evil? Does it fit into and become a harmonious part of the general system of law? These inquiries must be answered by applying as a test the principle which ought to govern in the particular case and which presumably it was sought to make prevalent by the formulated rule. It will be observed, therefore, that there is a study that is deeper and more far-reaching than the mere memorizing of rules. The rule is the visible sign; it may be committed to memory and mechanically applied to a condition or to conduct in human society; but the true conception of the rule and its right application in nearly all cases arising under it require a knowledge of the conception or principle behind the formulated rule. These rules are the facts that are to be investigated, and in these, or by their aid, the principles of law are to be found and a true science established. Every science must rest upon the facts within its realm. As the facts multiply in a given sphere of human knowledge, the conceptions increase in number, and as these are fitly joined together body of principles is created, and this constitutes a science; it may be of astronomy, or geology, or of law.

We have now reached a definition which is the modern conception of the word jurisprudence. It is the science of law; not the body of positive laws enforced by a particular state, but the body of principles and generalizations regarding all those "relations of mankind which are generally recognized as having legal consequences."

But our definition must be defined. To say the science of law raises the question at once, What laws are included? To be scientific the field of inquiry must have reasonably clear

boundaries. There are many laws. The word is sometimes misused, but we need not stop for the purposes of this definition to notice these inaccuracies. We have spoken of the divine law, the natural law, and we may now add the moral law and the laws of polite society. Are these within the field of investigation and study in constructing this science? They are in themselves important, but they certainly do not fall within the meaning of the word law as used in our definition. It is difficult to formulate a definition exactly covering the field of inquiry, and excluding that which belongs in the field of pure philosophy or metaphysics. Take that old definition, law is "a rule of civil conduct prescribed by the supreme power in a state, commanding what is right and prohibiting what is wrong"—a very good one for some purposes, but it assumes that all laws are prescribed and are commands of the state, but there are rules of conduct to be studied which can not be called commands of the state. If we say all laws are commands determining what is right and prohibiting what is wrong, we shall find ourselves limited to public law, statutory law, and judicial determination. This definition, therefore, is too narrow.

The moral law and what are termed the laws of polite society are certainly worthy of study and are to be observed; but these laws do not fall within our definition.

I do not say that an understanding of what is termed ethics is not necessary for the student of the science of law; it is important; without it the reasoning of the scholar will be quite wanting in essential quality and strength. But these laws fall within another science and do not come within our definition. Like most of the principles of science, this word law may be defined in a variety of ways, and taken together these definitions may include all that is to be considered; but it seems preferable to have some fixed guide outside the wording of a rule; therefore, adding international law, I like the definition of Sir Frederick Pollock, who says law is "the sum of those rules of conduct which courts of justice enforce, the conditions on which they become applicable, and the manner and consequence of their application." This refers us to the jurisdiction of courts.

I do not say that in determining the principles contained in

the rules of conduct to be studied we may not call to our aid as tests rules and recognized principles that lie outside of this definition. What I claim is that to constitute the science of law, as the phrase is here used, it must be a system or group of principles which pertain to, and should be embodied in, the rules coming within this definition of law. To determine whether a given rule comes within the general definition quoted, we have only to inquire whether it be, first, an international law recognized by the civilized nations of the earth, a principle which dominates states in their intercourse with each other; or, second, whether it be a rule which the courts of justice of a civilized nation enforce, or follow in determining the conditions on which the substantive law becomes applicable, and the manner and consequence of its application. This includes the whole field of the judicial and professional action of judges and lawyers.

Having limited the science to the laws falling within this jurisdiction, we may now say that the first and highest conception of jurisprudence is that it is the knowledge of a body of principles, coördinated and systematized, pertaining to the fundamental laws which states and the courts of states recognize and enforce in determining the conduct of a state in its dealing with other states, the privileges of citizens temporarily within foreign territory, the relations and obligations of inhabitants to the state, and the relations of these inhabitants with each other.

This conception gives a well defined field to jurisprudence. It is not the "study of law" as that phrase is usually and properly understood, meaning the study of formulated law stated in maxims, constitutions, statutes, opinions, and decrees of court, but it is the field which in a sense lies back of all this; it is the body of principles, the spirit of the law, which enlightened authority will seek to embody in the visible formula.

And now let me ask whether there is not another meaning, secondary it is true, that may properly be given to this word "jurisprudence." It is a science; may it not also be called an art? The proper application of a science to the construction of visible things is something more than the putting together of material. A carpenter can build a house, but only

an architect can apply the principles of the science of architecture in the building of a house. The carpenter and the architect in common use stone, brick, mortar, and wood; the structure made by the carpenter may be strong and may serve as a shelter from the storm; but the architect puts some things into his building which are not material. We call this adaptation to a particular use; proper proportion, adornment. The one has a knowledge of a body of principles which the other does not possess. This knowledge is science. The application of it in the construction of a building is an art. Is there an art in formulating law for the conduct of peoples? A tyro may put together words and create a law. It will have authority, and may chance to express some true principle of government, but it will not have proper limitations; it may disregard conditions; it may destroy or impair the operation of other principles of equal value, or create the very evil it seeks to destroy.

Suppose a legislature, impelled by some sentimental reason, exercising its political and legislative power, should undertake to determine the primary evidence of a contract in an action thereon between principal and agent, and should enact that the paper containing the order to which the principal affixed his name with his own hand should be the best evidence of the authority given. This would give expression to a very sound principle, for is not my letter to my agent the true and best evidence of what he is to do for me? But what about orders by telegraph under such a statute? This great agency of commerce is overlooked. The agent will not act upon the message delivered to him, for it is not the best evidence of his authority under such a statute. Wise jurists have worked the problem out differently in the best interest of trade by making the dispatch delivered and to be acted upon the best evidence. Under a statute such as we have supposed, the use of one of the greatest facilities of commerce would be practically destroyed, while under the rule formulated by the jurists the telegraph has become an efficient factor in modern business.

Again, a legislative body determines in its legislative capacity that it will prevent the formation of industrial "trusts" and passes an act declaring all contracts, combinations in the form of trusts, or otherwise in restraint of trade void, and the

persons making them guilty of a misdemeanor ; now, suppose that the common carriers, the railroads, to protect themselves against the demands of powerful corporations for special rates and privileges, enter into contracts fixing a fair rate to be charged all shippers alike, and providing heavy penalties to be paid by the company violating the contract. A case comes before the proper tribunal involving the contract between the railroad companies, and this act by its wording is declared to apply not only to the trusts but also to the railroads—these quasi-public corporations carrying on the business of transportation—and the railroad contracts are declared void. Thereupon a great corporation, which the legislature so much feared, now demands special rates and privileges over the public highways ; it insists upon lower rates and better services than are accorded to its competitors in order that by such favoritism it may crush out competition and secure a monopoly. It sends millions of tons of freight, and the manager of every line of railroad is anxious to get the business. Will the manager yield to the demand and give the special rate to get the business ? Will he give better rates and facilities than his competitor across the way in order to secure the traffic of this producer and shipper of enormous quantities ? It is competition, and that is what the legislature wanted. There is now no mutual contract between these quasi-public servants, with penalties attending the violation of the agreement, to prevent acceding to the demand. The special rate will be given and the industrial trust which this legislation sought to curb thrives under the law. The great corporations could hardly have done better for themselves had they formulated the statute.

All who formulate law, be they legislators or jurists, must use words ; but the jurist, having a knowledge of the science of law, will put into his formula limitations which will recognize existing agencies and conditions in society, and while he gives force to the principle invoked he will not allow its operation, through the careless wording of the rule, to destroy or impair the operation of other principles of equal value. He has a knowledge of the science of law and formulates his rule according to its principles, using words covering all the condi-

tions and principles involved. This is the use of the science ; the application of the science ; the ART of jurisprudence.

We may next inquire whether it is proper to affix any territorial limits to the investigation. In other words, can there be a jurisprudence of a particular state ? Is it proper to speak of the jurisprudence of England, or of France, or of Germany, or of any other nation ? Can there be more than one science of law ? We must recognize that there is a diversity in the forms of government which formulate and enforce rules of conduct. Peoples differ in language, pursuits, knowledge, and many of the things embraced within the word civilization. May there not, therefore, be a principle good for one nation which is error, or at least half truth, for another nation ?

Take the two great systems, the Roman law and the English common law. The Roman, at least as finally codified, was the product of cultured minds selecting and creating rules according to their best judgment of right and expediency. On the other hand, the common law was the product of the people adjusting themselves to community life, and in the adjustment contending, one class insisting upon a certain rule of conduct and another class claiming another rule with reference to a particular matter ; neither party obtained what it claimed, but they agreed at last upon a rule that should be observed by both. A common practice was thus established, which in time was recognized and enforced by the courts and became a common law. For illustration, the feudal lord demanded an unlimited service from his vassal with undefined rights in the land, and the vassal made like demands upon those under him. The sturdy Saxon, loving definiteness, demanded that the amount of service which he was to render to his over-lord should be defined, and for that service he should have a particular interest in the soil. Out of these controversies, extending through years of time, there came at last a complex system of real-estate law, with its multitudinous tenements and rights. Again, the king contended for absolute sovereignty ; the lords and their followers asked for certain liberties and rules of conduct, to be obeyed not only by the people, but by the king himself. There was stubborn contention, and out of it came the English constitution. These differences in origin between the two great systems would cer-

tainly give the greatest opportunity for two sciences of law. But can it be said that the fundamental principles of right which control those relations of men, generally recognized as having legal consequences, are so very different in the two systems? There may be a difference of theory, difference of application, possibly a difference of condition upon which the law becomes applicable, but, so far as substantive right is concerned, there is remarkable similarity in the two systems.

Doctor Holland in his admirable work upon Jurisprudence, says: "A science of law might undoubtedly be constructed from a knowledge of the law of England alone, as a science of geology might be, and in great part was, constructed from an observation of the strata in England only; yet as there is no particular science of geology, so neither is there a particular science of law. For a science is a system of generalizations which, though they may be derived from observations extending over a limited area, will nevertheless hold good everywhere; assuming the object-matter of the science to possess everywhere the same characteristics." It is true, as again stated, that "the wider the field of observation, the greater, of course, will be the chance of the principles of a science being rightly and completely enunciated; but, so far as they are scientific truths at all, they are always general and of universal application."

After careful study of the subject, the foregoing position taken by this distinguished author seems to be correct in speaking of jurisprudence as a science. We shall find, as the science of law develops, that the tendency will be to a clear statement and coördination of principles which will be of universal application, and this will tend to the unity of the spirit of the law in all civilized nations, and the result will be of world-wide benefit to mankind.

As to the art of applying the science—my second definition—a different use of the word may be permitted. In America the formulation of statutory law is performed by the legislator chosen from political considerations and not because of juristic attainment; in England, having determined that a law shall be formulated, the work of doing this is turned over to lawyers. Again, in America the judge or member of the court formulates

the opinion of the court and it is published without change ; in England, a distinguished jurist edits the opinions, or quite often formulates in writing the opinion delivered orally by the court. In other countries there are other variations in practice. I do not say which system is the best ; I simply note the difference in the method of applying the science in the business of formulating law. In painting there is a science made up of generalization regarding colors, shading, perspective, but in the application of these universal principles in putting a picture upon the canvas, there are differences which constitute schools of art, as the French, the Flemish, and others ; so when jurisprudence is spoken of as an art we may, I think, properly speak of the English, the French, the German, or the American jurisprudence.

Having now defined our definition, we may next inquire as to the best methods of obtaining the principles which go to make up and which form the body of this science. First, there is the metaphysical method—the attempt to arrive at these conceptions by pure philosophy or reasoning. This method begins with the divine law, or the law of nature, so called, and traverses the field of ethical study, reaching certain conclusions ; it is largely speculative, in that it does not rest upon experience as a test of its rightness ; it is theory, not practice, that forms the basis of this method. The theory of the structure of the earth and of the heavens was at one time determined in this way, but it is found that more accurate and correct results are reached from the study and observation of strata of earth and rock. It was a better astronomy that came from careful observation of the motion of the planets. Safer conclusions are reached in all sciences by the study of simple known facts ; things visible to the eye ; matter which can be touched and handled ; practices which can be investigated. So we have learned to arrive at the true principles of law by studying actual rules of conduct which are or have been enforced by courts of justice. Each rule is considered not as a perfect rule, but as an attempt to establish some right ; to prevent some evil in society ; to confer a remedy. Analyzing the rule and noting its operation in human relations and conditions, it has been discovered that it had a certain amount of truth, and that in certain particulars it failed to

attain the purposes intended. Like the lines which the surveyor first runs, which are not expected to be right, they are studied in order to find out how far wrong they are and thus determine where right lies. Thus fundamental principles or generalizations are reached which are derived from and rest upon human experience in the administration of states. The study of the rule itself, its applicability, and its operation, are the only facts from which we may determine at last the true principle which ought to govern in a particular case.

All law, wherever administered, has a certain object in view. Generally speaking, it is the well-being of society; the greatest possible freedom of action to the law-abiding; the establishment and clear definition of rights and obligations; the righting of wrongs—all in the interest of the peace and the integrity of the community. Does a given law tend toward these results in any particular, as shown by its operation in any state? If so, we may assume that there is in it a true principle which may be taken into the account.

We are not only to discover principles, but the operation of each must be clearly observed in order to put it in right relations with others, and thus form a harmonious system. Every principle has its limitations; it can not work independently. For example, the rule that all law shall be equally applied to every person within the state is good, but the moment we undertake to apply this principle we find that its operation is limited by what is called the status of persons. It applies with all its force to persons of normal status, but must be suspended to some extent where the status of the individual is abnormal, as, for instance, where he is a lunatic or an infant. Other principles must be taken into consideration in determining the rights or the protection which should be extended to these persons occupying an abnormal status. Conditions also change the operation of law. Take for illustration the rule that certain contracts in restraint of trade are against public policy and void. Under the old and simple conditions of business and the very limited territory of competition, the rule needed very little safe-guarding, but with the modern development of trade and commerce, the introduction of steam, the extension of territory, and the growth of population, the word "reasonable" must be introduced and defined

and given its proper force and effect in applying this rule. Not all contracts in restraint of trade are void, but only those contracts which are an unreasonable restraint of trade.

The method, therefore, must be the historical investigation of formulated law, a careful analysis of each rule, with close observation of its operation and of the ever-changing conditions of society. This method will give us the true foundation for generalization and a harmonious system.

The comparative study of law is of the greatest importance, for in the wider observation of law and of its operation under varying social conditions, the better and sounder will be the conclusions reached.

This science will never become fixed and determined; it is necessarily progressive. Conditions of life are continually changing, and laws must be modified and changed to meet the new conditions. There are certain great principles governing the relations of mankind which will always remain the same, but in their application the formulated rule will have to be changed to meet the growing and developing life of man.

The science is adaptable, easy of administration, for it is not bound by any mere verbal statement; here the spirit, not the letter, of the law prevails. The formulated rule may need revision, but a system made up of true principles, all in right relation to each other, will meet changes in social, industrial, and economic conditions in any state, and form the basis and right standard for rules of conduct in every nation. The world may not realize the dream of the poet for the federation of man under one universal government, nor may we expect, under varying forms of government and different methods of applying the science, a uniformity in formulated rules, but it is not unreasonable to hope that in the development of jurisprudence as a universal science there will come a unity of the spirit of the law throughout the civilized world.

II.

THE PROPER GRADE OF DIPLOMATIC REPRESENTATIVES.\*

BY JOHN W. FOSTER, LL. D.,

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In the letter inviting me to speak on this occasion, I have been requested to prepare a paper on present problems in diplomacy.

Had I been asked to treat of present problems in international law, I would have found a wide field open for our consideration. That branch of jurisprudence is a progressive science. Old theories, such as *mare clausum* and the three-mile ocean limit, are being discarded or modified by the changing conditions of commerce and invention, and new principles are sought to be introduced into the code of nations. The question of the exemption of private property from seizure on the high sea in time of war, advocated more than a hundred years ago, is still under discussion and likely at no distant day to be accepted by the nations. The practice of blockade has undergone marked changes in the past century, and the theory of peaceful blockade is under present-day discussion. Modern warfare has created new questions. It is requiring a revision of the contraband list and a more accurate definition of the rights of neutral ports, accepting more humane methods, and raising new topics, as the use of mines on the high sea and the proper restrictions as to wireless telegraphy.

But in diplomacy, strictly so called, we find few topics the subject of debate. The one which I consider of most importance is that to which I ask your attention—the *proper grade of diplomatic representatives*.

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International law is of modern origin and recent growth, the attempt at its codification only dating to the seventeenth century, and it scarcely came to be recognized as binding upon nations before the nineteenth; but the practice of sending and receiving ambassadors or diplomatic representatives has existed among nations from the earliest recorded history. The ancient Egyptians are known to have frequently observed the practice; early biblical history contains references to the custom; it was quite common among the Greek states, and observed by Rome both during the Republic and the Empire.

But in all these cases and during the early period of modern European nations, embassies or missions were only used on special or extraordinary occasions, and were of a temporary character. Not until late in the fifteenth century did the diplomatic service become permanent in its character and the governments establish resident embassies or missions. This stage of organized growth was reached, however, a century and a half before Grotius began the task of giving shape and authority to international law. Still the rights and duties of diplomatic representatives were at that period imperfectly defined. This is seen in the accounts of the great congresses or conferences, following the long wars of the European powers—those of Westphalia, Ryswick, and Utrecht; and the controversies then developed over the rank or relative standing of the respective ambassadors had a marked influence in fixing more accurately their status, but not until the Congress of Vienna in 1815 did the grade of the members of the diplomatic corps become authoritatively established.

It is a matter of some interest or curiosity, in this connection, to recall the fact that the question has been mooted both in Europe and America whether, in the existing conditions of the world, the diplomatic system is necessary and its utility justifies its expense. It is claimed that with the present development in steam communication, the rapid transmission of intelligence by electricity, and the general diffusion of news by the press, diplomatic negotiations might readily be carried on directly between the foreign offices of the various governments, that the interests of citizens and subjects might be attended to

by consuls, and that on extraordinary occasions the business might be intrusted to special temporary missions. With many the diplomatic service is regarded as a purely ornamental branch of government and its maintenance a useless expenditure of public money.

This subject was some years ago considered by a special committee of the Parliament of Great Britain. Lord Palmerston, the Prime Minister and the best informed and most experienced statesman of his day in international affairs, was examined. John Bright put to him the question "Whether it would not be practicable to transact the ordinary business by means of written communications between the two foreign offices, and when anything arose requiring particular attention to have a special mission of some member of the Cabinet?" Lord Palmerston replied: "I do not think it would," and proceeded to give the reasons for his belief.

Mr. Cobden propounded the following: "If you go back two or three hundred years ago, when there were no newspapers, when there was scarcely such a thing as international postal communication, when affairs of state turned upon a court intrigue, or the caprice of a mistress, or a Pope's bull, or a marriage, was it not of a great deal more consequence at that time to have ministers at foreign courts \* \* \* than it is in these constitutional times, when affairs of state are discussed in the public newspapers and in the legislative assemblies? \* \* \* Under these circumstances are not the functions of an ambassador less important now than they were two or three hundred years ago?" \* \* \*

Lord Palmerston replied: "I should humbly conceive that they are more important on account of the very circumstances which have just been stated. \* \* \* I should think that the change which has taken place with regard to the transaction of public affairs in Europe tends to make diplomatic agents of more importance rather than of less importance."

This question has been made more than once the subject of inquiry by the Congress of the United States, and the various presidents and secretaries of state have given their opinion in favor of the utility and necessity of the service, and the Con-

gress has continued to authorize it. The controlling judgment is well expressed in the language of Secretary Frelinghuysen to Congress: "Diplomatic representation is a definite factor in the political economy of the world; and no better scheme has yet been devised for the despatch of international affairs, or for the preservation of friendly relations between governments." President Harrison, after his retirement from public life, left on record his view of it as follows:

"The diplomatic service has sometimes been assailed in Congress as a purely ornamental one; and while the evident necessity of maintaining the service is such as ought to save it from the destructionists, it is quite true that our diplomatic relations with some of the powers are more ceremonious than practical. But we must be equipped for emergencies, and every now and then, even at the smallest and most remote courts, there is a critical need of an American representative to protect American citizens or American interests."

The grade or rank of diplomatic representatives has been the subject of discussion and fierce controversy from the date of the first establishment of permanent missions, more than four centuries ago, and although it was thought to have been finally and definitely settled at the Congress of Vienna in 1815, and that settlement was accepted and followed by the United States, it has recently been a source of discussion and embarrassment at Washington. To fully understand the question, it will be proper to make some reference to this controversy in the past.

A diplomatic envoy is the representative of his government or sovereign, and his claim of rank is for his country and not for himself; so that the controversy in the past has been one of nations rather than of persons. During the mediæval period the struggle of the European nations for preëminence in rank was the special feature of the era, and it gave rise often to the most absurd pretensions. It was sought to be maintained for various reasons, such as: The title of the sovereign, the size of the dominions, the antiquity of the royal family or date of independence of the country, the nature of the government (whether monarchy or republic), the population, its achievements in arms, the date of the conversion of the people to Chris-

tianity, and even the services rendered to the Pope or the church. Up to the time of the Reformation, the Pope was universally recognized in Christendom as having precedence over all sovereigns; next in order was the Emperor of Germany, as successor of the Roman Emperor, and below them a constant strife existed among the nations. For a time the republics were refused what were termed "royal honors," but finally Venice, the United Netherlands, and Switzerland were accorded recognition in the order of precedence here named. The title of Emperor was sought to be made exclusive to the old German Empire, and Russia was forced to wait several generations after its ruler assumed that title before being accorded recognition as such. Four centuries ago the Pope of Rome, by virtue of his conceded preëminence and ecclesiastical authority, sought to settle the vexed question by issuing an order fixing the relative rank of the then existing nations of Christendom. It illustrates the intensity of feeling which the question had aroused to state that, notwithstanding the high papal authority of that date, this arbitrary settlement was not accepted and was only observed in Rome, and even there merely for a brief period. It also illustrates the evanescent character of the honor and the changes of the governments of the world, to note that of the score and a half of nations enumerated in the papal order only three (England, Spain, and Portugal) exist today with the royal titles then accorded them. It is also curious to note that in this table of precedence England stood eighth in order and Russia does not appear in the list.

A large part of the deliberations of the great congresses of European nations up to and even including the early part of the last century was taken up in settling the question of precedence among the envoys or delegates. This was notably so at the conference of Westphalia. At the congress of Ryswick a warm debate occurred over the demand of the ambassadors of the Emperor of Germany that a particular space should be set apart for their carriages, and that this should be the post of honor; a fierce quarrel occurred over the allotment of rooms, and in the conference room a single table had been provided; but no agreement could be reached as to the order of seating,

and so in that room they all stood, and another room was provided in which there was no table, and the envoys sat in a circle. At the diet of Regensburg the precedence of the ambassadors was decided by an arithmetical rule by which each had precedence over the rest twice in ten days. At Utrecht a round table was used, but this lost its accommodating qualities when it was discovered that the place of honor was opposite the door of entrance, and that every place of honor has a right and left. At this congress a quarrel for precedence took place between the footmen of the several ambassadors, in the account of which it is recorded that it "threatened to retard the peace of Christendom." Addison gives an amusing account in the *Spectator* of a discussion over it which he heard in one of the coffee-houses of London, the result of which he sums up in these words: "All I could learn at last from these honest gentlemen was that the matter in debate was of too high a nature for such heads as theirs, or mine, to comprehend." Macaulay in his History of England describes in his best vein the congress of Ryswick, which well illustrates these idle controversies.

The contest of envoys to these international congresses of the past have not been more animated and absurd than those of the envoys to the several courts of Europe. Many amusing and sometimes tragic incidents have been narrated of the latter, from which I give some instances. It is related that the Spanish ambassador in 1661, in order to secure a place in the royal procession next to the King and before his French colleague, attacked the latter's coach in the streets of London, hamstrung his horses, and killed his men, thus vindicating his country's greatness. When the plenipotentiaries of France and Austria met to settle the conditions of marriage between Louis XIV and Maria Teresa, in order to preserve the full dignity of their nations, they stepped together, with the right foot, side by side, into a council chamber hung in corresponding halves with their respective colors, and sat down at the same instant, precisely opposite each other, at a square table, on two mathematically equivalent armchairs. A story is told of two newly arrived envoys from Italy and Germany, who being unable to agree on which should first present his credentials to the King of France,

stipulated that whoever reached Versailles soonest on the day of their reception should take precedence of the other. The Prussian went the night before the audience and sat on a bench before the palace until dawn. The Italian, arriving early in the morning, saw the Prussian there before him and slipped surreptitiously through the door of the King's bedroom and commenced his salutation. The Prussian rushed after him, pulled him back by the skirts, and commenced his harangue. The memoirs of diplomatists and the histories of Europe are full of the exalted and absurd contentions of envoys, but the foregoing are sufficient to illustrate their extreme and often farcical pretensions.

None of the monarchs of Europe was more insistent upon his rank than the "Little Corporal" when he made himself Emperor of France. On inviting the Pope to attend his coronation, it was stipulated that the same ceremonies should be observed as at the coronation of the ancient kings of France; but on the arrival of the Holy Father, the latter was astonished to see Napoleon take precedence over him, as if there were no question about it. In 1808 he caused the edition of the *Almanach de Gotha* to be seized because, as was its custom, it arranged the reigning houses alphabetically and did not place Napoleon first.

The question of the precedence of nations extends into the negotiation and framing of treaties. In former times the more powerful or more ancient of nations claimed the right to be first named in conventions and other diplomatic instruments, and not until the nineteenth century has it been yielded. As one of the younger nations, the experience of the United States illustrates the progress made toward equality of treatment. In all of its treaties made in the eighteenth century it was named last. France first recognized with the United States in its treaty of 1803 (the Louisiana purchase) the practice of the *alternat*—that is, the right of each chief of state to have his name and the name of his plenipotentiary appear first in the original copy of the treaty or other instrument which he retains. Great Britain refused to concede this right to the United States in the treaty of peace of 1814 and in anterior

conventions, but, upon the insistence of the latter, yielded it in the treaty of 1815 and thenceforward. It was first conceded by Spain in the treaty of 1819. The Spanish negotiator in consenting intimated that on signing he might deliver a protocol against its use being made a precedent for the future; whereupon the stout John Quincy Adams informed him that the United States would never make a treaty with Spain without it.

The contest as to the rank of the states, which had been waged for centuries, was sought to be settled at the congress of Vienna of 1815. A committee was appointed with instructions to fix the principles which should regulate the rank of reigning monarchs and all questions connected therewith. The committee submitted a report to that end; but after a long discussion the Powers abandoned the project as one too difficult to realize, and confined their action to prescribing the composition and rank of the diplomatic corps only at their respective courts. But since that period, by the practice of governments, it has come to be recognized by them all that there can be no rank or precedence among independent and sovereign nations, but that all must stand on an equality in their negotiations. For instance, at the conference of Paris in 1856, one of the most important in that century, the representatives sat at a round table in the alphabetical order, in the French language, of their national titles. In the Bering Sea Tribunal of Arbitration of 1893 the United States had precedence over Great Britain because of this order of arrangement. The same practice was observed at The Hague Peace Conference of 1899. At that Conference it was expressly declared by the representatives of the great powers of Europe—"here there are no great, no small powers; all are equal, in view of the task to be accomplished."

The United States when at its independence it entered the family of nations accepted the order prescribed by the congress of Vienna in 1815, which, with the addition made in 1818, recognized the composition of the diplomatic corps in four classes, to-wit: Ambassadors, Ministers Plenipotentiary, Ministers Resident, and *Chargés d'Affaires*, with rank in the order

named. For more than a century this country sent abroad as its highest diplomatic representatives those of the second class, and this practice was observed up to a recent date. But the ministers plenipotentiary of the United States at the capitals of the great powers of Europe where ambassadors were maintained have repeatedly complained that they were often humiliated and their usefulness sometimes impaired by the lower rank which they were assigned in the diplomatic corps, and this assertion gained general currency and acceptance through the press. It is true that ambassadors take precedence over ministers in the order of reception and seating on public occasions, at entertainments, and, at some European capitals, in order of their admission to interviews at the foreign office. It certainly is not agreeable to a minister of the great American Republic, who arrives first at the foreign office, to be required to step aside and give place to the representative of Turkey or Spain and wait till the latter's audience is concluded with the Secretary for Foreign Affairs, simply because he bears the title of ambassador. Mr. Bancroft, the American Minister at Berlin, when subjected to this treatment protested against it, and Prince Bismarck decided that the practice should not be continued. Other American ministers who were made to suffer inconvenience or humiliation from the custom might possibly by firm or considerate remonstrance have obtained relief. The remedy uniformly suggested has been to raise the grade of representatives at the capitals named to that of ambassador; but the successive Secretaries of State declined to make the recommendation to Congress. Such was the action of Secretary Marcy in 1856. Secretary Frelinghuysen said that the department could not, "in justice to its ministers abroad, ask Congress to give them higher rank with their present salaries; neither could it with propriety appeal to Congress for an allowance commensurate with the necessary mode of life of an ambassador." When, in 1885, Mr. Phelps, the American Minister to Great Britain, urged that the mission be raised to an embassy, Secretary Bayard replied: "The question of sending and receiving ambassadors, under the existing authorization of the Constitution and statutes, has on several occasions had more or less forma

consideration, but I can not find that at any time the benefits attending a higher grade of ceremonial treatment have been deemed to outweigh the inconveniences which, in our simple social democracy, might attend the reception in this country of an extraordinarily foreign privileged class."

Notwithstanding the reasons given by successive Secretaries of State against the creation of the grade of ambassador, the Congress of the United States in 1893 did just what Secretary Frelinghuysen said would be an injustice to American ministers—authorize the grade without increasing the pay of its representatives. The legislation to this effect was inserted as a clause in one of the regular appropriation bills, and was passed through both chambers without a word of discussion or comment. If its effect in changing a practice of the Government for a hundred years had been made known at the time, it is extremely doubtful whether it would have secured the approval of the Congress.

An ambassador has been held in Europe to be the special or personal representative of his sovereign, and to stand in his place at the foreign court, with the right to claim audience at any time with the head of the state, and entitled to privileges and honors not accorded to other envoys of nations. This claim had some force when the monarch could boast, "I am the state;" but with the establishment of constitutional government and a responsible ministry, all foundation for such a claim was removed, and it certainly should have no place under a republican form of government.

Events in Washington following the passage of the law creating the grade of ambassador in the American diplomatic service have shown that Secretary Bayard was not astray in his fears as to "the inconvenience which in our simple social democracy might attend the reception in this country of an extraordinarily foreign privileged class." The reception of ambassadors from Great Britain, France, Germany, Russia, and Italy, in reciprocity for the nomination of American ambassadors to those countries, was followed by the scandalous scenes in the Senate chamber on the first inauguration day following their appointment, when in the zeal of the subordinate

officials to show special honor to those newly created and exalted dignitaries, all the other members of the diplomatic body were neglected and left to find their way to their residences without an opportunity to witness and honor the induction of the new President into office; and, if the press reports are to be credited, further trouble was occasioned by the question of the proper location of the ambassadors at the last inauguration. Then came the problem whether the Vice-President of the United States should make the first call upon the new ambassadors, and the further question whether the Secretary of State, who stands second in succession to the Presidency, and on the death of the Vice-President first in succession, should give place at entertainments and public functions to those dignitaries. These momentous questions were doubtless settled aright in the light of European precedents, and the good sense and prudence of the eminent gentlemen who hold the ambassadorial rank have, it is probable, prevented other embarrassing and foolish questions from arising; but these events, and those which attended the advent of the Mexican ambassador, whose coming was resented by the European ambassadors, as well as the recent unpleasant incident at the White House, when the ambassadors collided with the Supreme Court, would have been avoided if the act of 1893 had not been passed. When the act creating ambassadors was passed by Congress the Government of the United States had grown to recognized greatness and dignity in the eyes of European sovereigns, its diplomatic service had in the past hundred years and more won deserved honor and distinction, and it did not require the bauble of a title to give its envoy greater standing or efficiency. I doubt very much whether the absence of rank has ever prevented any really able minister of the United States from rendering his country a needed service.

I have referred to the theory that ambassadors, because of their supposed investiture of a special capacity to represent their sovereign or head of their state, have the right to demand an audience at any time with the chief of the nation to which they are accredited, and that such right does not pertain to diplomats of the next lower grade of ministers plenipotentiary.

It is a theory which has come down from the mediæval period, but in modern times has become pure fiction. Vattel says of ambassadors that their "representation is in reality of the same nature as that of the envoy" or minister plenipotentiary. Calvo, one of the highest living authorities on international law, referring to the claim that ambassadors "have a formal right of treating directly with the sovereign, of which the others (ministers) are deprived," says: "This is a distinction without a meaning, especially since the organization of modern nations no longer rests exclusively upon the monarchical principle, and therefore renders it impossible for sovereigns personally to conduct international negotiations. \* \* \* In our eyes the agents of the first two classes are exactly on the same line from the point of view of their character as of their duties and powers." Martens, the leading authority on diplomatic ceremonies and practice, writes: "Considered from the point of view of international law, all diplomatic agents, without regard to their class, are equal. This equality is shown by their all possessing, in a like degree, all diplomatic rights. \* \* \*

Many writers have tried to infer from the rules of Vienna that ambassadors, as representing the person of their sovereign, have, in distinction from other diplomatic agents, the formal right of treating with the sovereign to whom they are sent, and of being received in audience by him at any time. We can not admit this inference. As Prince Bismarck opportunely remarked, 'no ambassador has a right to *demand* a personal interview with the sovereign.' The constitutional government of west European monarchies compels ambassadors to treat with the minister of foreign affairs." Lawrence (T. J.), one of the latest authors on international law, says: "Ambassadors, as representing the person and dignity of their sovereign, are held to possess a right of having personal interviews, whenever they choose to demand them, with the sovereign of the state to which they are accredited. But modern practice grants such interviews on suitable occasions to all representatives of foreign powers, whatever may be their rank in the diplomatic hierarchy. Moreover, the privilege can have no particular value, because the verbal statements of a monarch are not state acts. Formal

and binding international negotiations can be conducted only through the minister of foreign affairs."

It has been seen that the increased expense of maintaining an embassy was one of the reasons given by American secretaries of State against the creation of the grade of ambassador. The style of living or the establishment which a diplomatic representative maintains has been given great importance, especially in the European capitals. It is a curious fact that in the early period after the establishment of embassies or legations it was the practice for the government to which the ambassador was accredited to defray his expenses. For instance, we have the record that the court of Vienna in 1679 appropriated a sum equal to \$2,000 per week to meet the expenses of the Russian embassy, and of the Turkish embassy something over \$1,000. A century later the Turkish embassy at the same court cost the latter 2,000 rubles daily. The Papal legate at Paris in 1625 cost the King of France 2,500 livres daily. The celebrated Lord Macartney British embassy to China is said to have cost the Chinese government a sum equal to \$850,000.

But in the course of time these splendid and extravagant expenditures became both burdensome to the court which furnished them and humiliating to the representatives of the country receiving them, and it came to be the practice of each government to defray the expenses of its own mission; but it was assumed that this should be done on a scale befitting the dignity and standing of the nation, and governments are supposed to keep this standard in view in making their appropriations for the diplomatic service. An envoy who is sent abroad to represent his country ought not to be expected to maintain a more expensive establishment than is warranted by the salary paid him, and yet every American ambassador accredited to the capitals of Europe, who in any degree meets the expectations of his countrymen, spends annually much more than he receives from the National Treasury.

But the Government of the United States is not the only one which fails to meet the expenses of its embassies. In his testimony before the Parliamentary committee from which I have already made extracts, Lord Palmerston stated that the

alary of the British ambassador in Paris was not sufficient to meet the outlay actually made by him ; and yet the salary and allowances of the British ambassador are more than three times as great as those received by the American ambassador to that capital. I have been informed on the best authority that when the post of British ambassador in Paris became vacant a few years ago by the retirement of Lord Dufferin, it was offered in succession to three British statesmen of prominence, who declined the honor on the ground that they could not afford the extra expense that would necessarily have to be met from their private purse.

This fact may suggest the inquiry whether the style of living of ambassadors and the demands made upon them have not exceeded the proper bounds, and whether there is not some force in the argument used to justify Congress in its course, that it is not becoming our democratic representatives abroad to maintain such an ostentatious and extravagant style of living. The change of the American legations to embassies in the European capitals seems to have called for the maintenance of large houses or palaces and a much more lavish style of living, which have so greatly increased their expenditures that only persons of wealth can afford to accept these posts. It is a sad day for any country, but more especially for a republic, when its highest offices cease to be rewards of merit and fitness and when they can only be filled by rich men.

Many incongruities and embarrassments result from the continued adherence to the several grades or rank in the diplomatic service established a century ago by the congress of Vienna. The great powers of Europe, the United States, and Mexico, send to other governments respectively the four grades of diplomatic representatives, and even a fifth grade has been added by some of them, who clothe consular officers with diplomatic functions under the title of diplomatic agent, but no uniformity of action is observed. France, for instance, accredits an ambassador to Switzerland, but ministers plenipotentiary are sent by the other neighboring powers—Germany, Austria, and Italy. On the other hand, France accredits only a minister plenipotentiary to its neighbor, Belgium. Another illustration of irreg-

ularity or inconsistency is found in the diplomatic body to the independent government of Morocco. There are ministers plenipotentiary from Germany, Great Britain, France, Italy, and Spain, ministers resident from Austria and Russia, chargé d'affaires from Denmark, and the United States is represented by a consul general, who acts in a diplomatic capacity, but in grade stands below all other powers.

Each government determines for itself the grade of representative it will send to other countries, but the government to which the representative is sent claims and exercises the right of receiving or rejecting such person because of grade. But reciprocity of grade is not always observed. A representative of a lower grade is sometimes received from a country to which one of a higher grade is sent. The irregularity of rank is likely at any time to create diplomatic embarrassments, as it already has in more than one instance. We have seen that the reception at Washington of an ambassador from Mexico was resented by the ambassadors of the European powers. As one of them remarked to me, they did not regard Mexico as sufficient in population and importance to exercise the right of ambassadorial appointment. Suppose China, embracing more than one-fourth of the population of the earth, older by thousands of years than the oldest of the so-called great powers of Europe, and possessing a high grade of civilization and intellectual attainments, should accredit ambassadors to those powers—upon what reasonable ground could they be rejected? And yet should they have an intimation that such was the intention of that ancient empire, it is more than probable that its foreign office would receive such representations as would lead it to desist from its intention.

The most serious embarrassment resulting from this difference in grade of diplomatic representation is furnished by the relations at present existing between the United States and Turkey. For a number of years past these relations have been in a most unsatisfactory condition. In no country of the western world could the old fiction of the ambassador as the personal representative of the sovereign today approach so nearly a reality as in Turkey, as the Sultan is more fully than any

other monarch the personal ruler of the state. All the great powers of Europe, and even the Shah of Persia, are represented at Constantinople by ambassadors, and they exercise the right of access to the Sultan at will to discuss official matters. The American ministers plenipotentiary have represented to their country that it is very difficult to get any just and proper consideration and dispatch of their business, because of the irresponsible character of the secretary for foreign affairs or even of the grand vizier, as all important matters are determined by the Sultan; and that, as they do not possess the ambassadorial character, they can not without great difficulty have audience with him to discuss official business.

To remedy this embarrassment, President McKinley caused application to be made to the Turkish government for the appointment by the two governments respectively of ambassadors; but the proposition was not accepted by Turkey. The condition of the interests of American citizens in that empire continuing to be very unsatisfactory, President Roosevelt renewed the application for the appointment of ambassadors; but it was again rejected. It can not well be understood in the United States why this application should be refused, when ambassadors from much smaller and less powerful countries, like Italy and Persia, are received at Constantinople.

Last year a delegation of some of the most prominent citizens of the United States, representing large property interests in the Turkish Empire, made a visit to Washington and laid before the President a memorial, setting forth that American citizens and property in that empire were denied the rights and protection which had been secured by the ambassadors of the great powers of Europe to their subjects and property interests. The President being impressed with the justice of the memorial, caused a cable instruction to be sent to the American minister in Constantinople, directing him to ask for an audience of the Sultan in the name of the President, to enable him to communicate a message from the President to the Sultan on the subject of the memorial. After a delay of some weeks an audience was granted on the express condition that the minister should be limited to delivering the message of the Presi-

dent, but that he would not be permitted to discuss the subject with the Sultan.

Even this decisive action of the President seems to have had no effect, as the American citizens continued to be deprived of the rights and privileges enjoyed by the subjects of the great powers of Europe, and for a third time an application has been made and rejected for the reception of an American representative with the grade of ambassador. The press has informed us that the American minister at Constantinople, under renewed and urgent instructions from Washington, pressed for a settlement of the question at issue, but that he was greatly delayed and embarrassed by the fact that the ministry have no real power to dispatch any important public business, because the Sultan reserves to himself that prerogative, and that, not being an ambassador, he found great difficulty in reaching the Sultan. Meanwhile this important question remained undetermined, and it became necessary to dispatch a formidable American fleet to Turkish waters to evidence the President's interest in the question, and the fleet was held in the Turkish port until the demand of the United States was complied with. What more striking argument can be presented against the maintenance of the various grades in the diplomatic service?

There is no good reason why the representative of the smallest American republic or European principality should have a different standing, for instance, at the foreign office in London from that freely conceded to him in the Peace Conference of the nations at The Hague; neither should it be expected that any government would be forced, because of a mere grade in the diplomatic hierarchy, to maintain a more lavish display at a foreign court than its principles or convenience would determine.

The remedy for the embarrassments arising from diplomatic rank is a simple one. In the reference I have made to the foolish contests which were carried on for centuries by the nations of Christendom, great and small, for precedence, we have seen that only one solution of the problem could be found, and that was so simple we wonder now that so fierce a warfare

could have been possible—that is, recognition of the equality of sovereign nations, so that today the smallest republic of Central America is equal in negotiations and at international conferences with the most powerful empire of Europe. There will be no satisfactory settlement of diplomatic rank until all distinctions and special privileges are abolished and a single grade is established in all the capitals of the world.

### III.

## THE RELATIONS OF TECHNICAL CHEMISTRY TO THE OTHER SCIENCES.\*

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As the term technical chemistry is usually used, it refers to the commercial production of substances through a change in the chemical composition of the matter employed in their manufacture. All manufacturing operations are either chemical or physical ones or both chemical and physical. The manufacture is a chemical one when the substance or substances acted upon undergo a change in composition. The manufacture is a physical one when the substance acted upon undergoes a change in form, state, state of aggregation, appearance, or properties without any change in its composition. Many manufactures, probably the majority, include both chemical and physical processes in their operations. In most manufactures the chemical processes are the basic ones producing the material, which is afterward shaped and assembled by physical means in the form in which it is to be used.

The variety of substances embraced in chemical technology is shown in such a work as Wagner's Chemical Technology, but no statistics indicating its magnitude are to be found, except in the reports of the United States Census, this being the only country which takes a census of manufactures. Following the classification of Wagner, I have compiled these statistics for the years 1890 and 1900:

*Statistics of Chemical Manufactures in the United States, 1890 and 1900.*

Year.	Number of establishments.	Number of wage-earners.	Total wages.	Cost of materials used.	Value of products.
1900	84,172	1,038,543	\$469,848,022	\$3,392,211,974	\$4,962,715,787
1890	58,195	710,485	311,369,495	2,177,443,777	3,165,768,188

\* Prepared for and read at the International Congress of Arts and Science, St. Louis, September 23, 1904.

The term technical chemistry may, however, properly be extended to include the work done by chemists not engaged in manufacturing, but which aims at a utilitarian application of the results. First in order of development among these is the class of chemists engaged in the work of chemically inspecting material from all sources to ascertain its suitability for its proposed uses, or its purity, or its conformity with the specifications under which it was purchased. All economically managed and well conducted operations of any magnitude today are subjected to this check. In fact we may say that, since governments by legislation specify the fineness as well as the weights of the gold and silver coins they issue, and since the fineness of these coins as well as of the bullion in the Treasury is constantly proved by analyses, therefore every commercial transaction throughout the civilized world is eventually based upon the results of chemical tests. The historian Du Cange gives the credit for "inventing" assaying to Roger, Bishop of Salisbury, during the reign of Henry I. Be this as it may, it is owing to the accurate analyses of assayers such as Tillet, Stas, Graham, Torrey, Eckfeldt, Roberts-Austen and their successors that the credit of our metallic currency has been and is maintained. The office of public analyst and assayer, or, as it is often styled, "State Assayer," is of long standing, Charles XI of Sweden having, in 1686,\* established a technical laboratory for the chemical examination of natural products and the working out of processes for their practical utilization. The census of 1900 reports that there were 8,847 persons practicing in the United States in that year as chemists, assayers, and metallurgists, and it is gratifying to observe that this class of technical analytical chemists is rapidly increasing in numbers and importance.

Second in the order of development is the work done in the technical research laboratories, where methods are tested and criticised, processes are developed, apparatus and machinery invented, new products discovered, new applications for known products found, and where yields and costs are ascer-

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\* History of Chemistry, E. von Meyer, page 138.

tained. Notable among these are the famous research laboratories of the Badische Aniline und Soda Fabrik, the Welcome Research Laboratories, and many others that may be readily called to mind, and so fruitful and valuable have these establishments proven that similar ones are rapidly being established about manufacturing works. Their success seems also to have suggested the formation of the independent research companies, formed explicitly to combine research with practical application, especially in electro-chemistry, one such located in this country having, among others, developed processes for the manufacture of barium hydroxide, synthetic camphor, and nitric acid from atmospheric nitrogen.

Of necessity many of the arts preceded the sciences, and this was especially the case in chemistry, as many of the arts embraced in technical chemistry, such as the utilization of fuel as a source of energy, the manufacture of alcoholic beverages, bread, soap, glass, and dyestuffs, the isolation of metals, the expression of oils, and the extraction of sugar, starch, gums, glucosides, and alkaloids, among others, were practiced, in an empirical way, long before the science of chemistry took form. In 1724, after chemistry had emerged from alchemy, Boerhave defined chemistry as "an art which teaches the manner of performing certain physical operations whereby bodies cognizable to the senses or capable of being rendered cognizable or contained in vessels are so changed by means of proper instruments as to produce certain determined effects, and at the same time discover the causes thereof for service in the arts."

The science of chemistry was a growth from the art and gradually developed. It was a crude science when the phlogiston theory was propounded, and many of the advocates of this theory, such as Stahl, Marggraf, Scheele, Bergmann, Priestley, Cavendish, and Black, contributed much valuable experimental and observational data from their researches. But it takes date as a recognized science when Lavoisier provided it with a systematic notation and nomenclature, Dalton enunciated his atomic theory, and Berzelius demonstrated the constancy of combining proportions and of constitution, and

its growth since the beginning of the nineteenth century has been almost marvelous.

The distinction between pure and applied chemistry was universally recognized toward the middle of the eighteenth century, special text books on technical chemistry, in which theory was combined with practice, and embracing analytical processes, particularly as they related to ores, being issued. In fact, from the outset technical chemistry has naturally drawn continually upon pure chemistry for products, processes, and apparatus, modifying the processes and apparatus to meet the conditions of factory practice. So rapid, however, has this adoption of the appliances of the university laboratory by the technical chemists become in these recent years, since university-bred chemists have been received in continually increasing numbers in technical chemistry, that it has proved a source of embarrassment to teachers of chemistry in this country, and for the following reason :

From the founding of the United States it has been a settled policy of the Government to foster education, and therefore the first Congress, in legislating on the tariff, exempted philosophical apparatus and instruments imported for use in education from duty, and this legislation was reenacted with enlarged provisions in every tariff act passed by Congress, except during the civil war, and once in 1846, when it was apparently omitted by inadvertence. This provision seemed to serve all intended purposes until some thirty years ago, partly because there were but few active laboratories for the teaching of chemistry, with a small number of students, and that the supplies were imported for only a part of these laboratories. However, with the increase in research laboratories in universities and technical schools, the introduction of laboratory courses for the large classes of pupils in the secondary schools, and especially the appointment of a considerable number of teachers of chemistry who had been educated abroad, the demand for foreign-made apparatus and supplies became quite considerable, and as the importations grew in magnitude and frequency differences arose between the customs officials and the importers as to whether the goods imported were actually those designated in the act ; the customs

officials, as was natural, considering their functions, ruling for that interpretation of the laws which would yield the Government the greatest revenue. Controversy, which became quite heated, arose particularly as to the meaning of the terms "philosophical and scientific apparatus, instruments, and preparations," and in 1884 the Secretary of the Treasury, to avoid any appearance of arbitrarily overruling his subordinates, which would have been subversive of discipline, took counsel of the National Academy of Sciences; but its opinion as rendered, while perfectly correct, failed of effect, and the controversies got into the courts on issues between merchants and the customs service in such form as to lead to decisions which the customs officials regarded as supporting their controversies against the schools. Such were the conditions in 1893, when the American Chemical Society appointed a Committee on Duty-Free Importations, which made an exhaustive search into the legislation, an inquiry into the litigation, and a study of the entire situation, until finding a favorable opportunity in an issue brought before the proper tribunal it convinced the judges that there were no instruments, apparatus, or preparations which today were exclusively used in teaching or research; that, on the contrary, our manufacturers and practitioners are so keen to utilize every resource at command, that they are the first usually to test, and if found profitable, to adopt any new invention in apparatus or discovery in preparation, while teachers must usually await the voting of appropriations or gifts from benefactors before they can possess them, and that as no distinction can be drawn either arbitrarily or from the rule of "principal use," we must revert to the "evident intent" of Congress to exempt education from the burden of the tariff, and in each instance the levying of duties or admission of the goods free must be determined solely by the fact as to whether or not they are to be used in the institutions designated by the act for educational purposes and research. It is pleasant to record that the board of appraisers, after thoroughly reviewing the history, adopted this view, and that during the present year Assistant Secretary Armstrong, in charge of the customs service, has promulgated it in a very satisfactory form for the instruction of his subordinates.

This is but one instance of a multitude which may be cited showing how technical chemistry "treads on the heels" of pure chemistry. It depends especially on the votaries of the latter for accurate determinations of chemical constants. Prof. F. W. Clarke has emphasized the importance of this in the case of atomic weights, taking the case of chromium\* as an example. He says: "The older and less accurate determinations for chromium led to the figure 52.5. The more recent and more accurate have given 52.1 as the number. The European technical analysts, who analyze chromium ores for the sellers, use the first-mentioned number; the chemists for the consumers in this country use the latter number, with the result that the difference in value on a cargo of ore weighing 3,500 tons is \$367.50."

The technical chemist has been keen to appreciate the necessity for authoritative standards by which his work might be controlled and to which matters in controversy might be referred. He has especially welcomed and willingly assisted in the formation of standard bureaus. In fact, the movement for the creation of a National Bureau of Standards in the United States originated in the Association of Official Agricultural Chemists through Mr. Ewell, and though when, on the motion of this gentleman, the plan was afterwards indorsed by the American Chemical Society, it received the complete approval of the pure chemists, Dr. William McMurtrie and Dr. Charles B. Dudley, who stand in the front rank as technical chemists, were most active in its promotion and successful in convincing our national legislators of the economic advantages which would result from the establishment of such an institution invested by law with the proper authority.

Technical chemistry is indebted to pure chemistry for much precise information regarding the properties of substances, especially as to their behavior toward reagents, and for accurate and carefully investigated analytical methods like those with which the honored name of Wolcott Gibbs is associated. But the technical chemist revises these methods and adapts

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\*J. Am. Chem. Soc., 19, 359; 1897.

them to his special needs, as shown in the standard work of Blair on the Chemical Analysis of Iron, and in others that might be cited, while he verifies the published data as to the particular substances with which he has to deal. Realizing that "time is money," he has devised, with the aid of the collected information, rapid methods of analysis\* which enable one to arrive at an approximately true and in some instances a very precise result in a few moments, when the academic methods require hours and perhaps days to arrive at the same conclusion. It is true that methods of this nature, devised to meet technical needs, have been generalized and made more available in the university laboratory. As an early example of this we have volumetric analysis, devised by Descroizille and Vaquelin, investigated and generalized by Gay Lussac, and as a recent example we have the use of a rotating electrode in electrolysis, long employed in the arts, critically studied and generalized by Smith, by Gooch, and by their pupils. Yet the systematic treatment of the accumulated material, the working out of a comprehensive scheme of qualitative analysis, and the collating, the sifting and the arrangement of correlated methods for quantitative determinations in a connected manner are due to C. Remigius Fresenius, who for so long conducted a technical analytical laboratory at Wiesbaden, and his publications are classics.

But technical chemistry has especially looked to the pure chemist, with leisure for thought and work and with libraries and other facilities at command, to correlate and discuss data, to trace relations, suggest hypotheses, invent theories, and discover laws which the technical chemist has been ready to test and, when proved, to be guided by. Today we find the technical chemists earnestly studying Arrhenius' theory of electrolytic dissociation, Willard Gibbs' phase rule, Van't Hoff's law governing osmotic pressure, Guldberg and Waage's law of mass action, and the many other valuable generalizations which

\*The number of determinations made in one week in the laboratory of the Bethlehem Iron Co. amounted to 2,444; accurate analyses of carbon being made in 12 minutes, of manganese in 10 minutes, and of phosphorus and silicon in 30 minutes. *Eng. & Min. J.*, 60, 375; 1895.

have resulted from the systematic cultivation of the borderland between the sciences of physics and chemistry that has been going on with increasing activity during the past quarter of a century. It is safe to say that the series of text books of Physical Chemistry now being edited by Sir William Ramsay, and of which the "Phase Rule and its Application," by Alex. Findlay, is the pioneer, will find their way largely into the libraries of the technical chemists. Many examples may be cited of the utilization of these generalizations in the solution of problems in technical chemistry, but Christy's\* admirable researches into the rationale of the cyanide processes for the recovery of gold from its ores will suffice. The experience of the past has repeatedly demonstrated the commercial possibilities that are latent in scientific theories. A famous example is found in the commercial development of benzene. Lachman, in 1898, after referring to its discovery by Faraday in 1825, and its production from benzoic acid by Mitscherlich nine years later, says:† "These famous chemists little thought that their limpid oil would once lay claim to be the most important substance in organic chemistry; that it would give birth to untold thousands of compounds; that it would revolutionize science and technology. The technical development of benzene and its derivatives employs over fifteen thousand workmen in Germany alone; the commercial value of the products reaches tens of millions of dollars; by far the greater portion of the research work done today is concerned with the same group of substances. Nearly all of this tremendous activity is due to a single idea, advanced in a masterly treatise by August Kekule in the year 1865. Twenty-five years sufficed for the chemists of all nations to recognize the inestimable importance of the benzene theory, for in 1890 they came together at Berlin to do honor to the man who had created a new epoch in the science." There is abundant verification of Hoffmann's statement that "the technologist is not likely to leave long without utilization any fact of science which may be developed and made valuable

\* Trans. Am. Inst. Mining Eng., **26**, 735, 1897, and **30**, 864, 1901.

† Spirit of Organic Chemistry, page 21.

from the technical side," and of Ostwald's saying "that the science of today is the practice of tomorrow."

In his most attractive book, "Physical Chemistry in the Service of the Sciences," Van't Hoff says: "There exists in Germany a very beneficial coöperation between laboratory work and technical work. Both go as far as possible hand in hand. After physical chemistry had made several important advances and was firmly established in such a way that pure chemistry was assisted by coöperation with it, Ostwald judged correctly that this coöperation would also be valuable in technical directions," and these views led to the founding of what is now the German Bunsen Society for Applied Physical Chemistry, whose considerable membership comprises both men of pure science and representatives of technical science. The suggestions of applications from men such as Ostwald, Van't Hoff, Bancroft, and others, accompanied as they are by striking demonstrations, are always most welcome and appreciated. But it is no new custom for the most eminent exponents of pure science to for a while step into the field of application. We have but to cite the names of Baeyer, Berzelius, Bunsen, Davy, Debus, Dumas, Faraday, Fischer, Frankland, Hoffmann, Liebig, Mabery, Remsen (to whom the medal of the Society of Chemical Industry has just been awarded) Williamson, and Wurtz as examples. Or, taking a single technical subject, such as the explosives industry, we have Lavoisier perfecting the manufacture of gunpowder; Gay Lussac serving on the advisory committee of powders and saltpeter; Berthollet inventing chlorate powders; Liebig investigating the fulminates and devising means by which the commercial manufacture and use of mercuric fulminate was made possible; Schoenbein discovering gun-cotton and introducing it for use as a propellant; Bunsen, with Schischkoff, making researches on the composition of powder gases and powder residues; Berthelot, led by a patriotic desire to serve his country in time of peril, exhaustively experimenting with explosives of every description, collecting and correlating the data of his own experiments with that previously recorded and combining this with the descriptions of the attendant phenomena and the theories he had

deduced from analyses of all this material in his "Force of Explosive Substances," and Mendeléeff and Dewar developing the smokeless powders adopted by the countries of which they respectively are citizens.

While technical chemistry is under manifold obligations to pure chemistry, the indebtedness does not stand unrequited. I would amplify this branch of my subject but that it has been so admirably done by Dr. William McMurtrie in his address on "The Relations of the Industries to the Advancement of Chemical Science,"\* in which it is shown that many discoveries which have materially affected pure chemistry have been made in the factories. It is a well-known fact and quite in the nature of things that the pure chemist is dependent upon the technical chemist for most of the material used in his researches, and the publications contain frequent acknowledgments of this fact.

Technical chemistry in common with pure chemistry is under lasting obligations to physics. It makes use of the physical properties of matter for purposes of identification and separation. It employs her instruments, such as the spectroscope, the polariscope, the microscope, the photometer, and a multitude of others, in analytical operations. It utilizes the various manifestations of energy in accordance with the physical laws which govern them, adopting the methods of transformation, conveyance, and application which the physicist has shown to be most efficient, convenient, and safe, though adapting them to the particular circumstances which obtain. It relies upon the physicist for the verification of its standards of mensuration, and, as previously stated, it employs physical, together with chemical, processes in its treatment of material in manufacture. A modern instance of this relation of technical chemistry to physics is found in the electrochemical industry. Starting with the remarkable experiments of Sir Humphrey Davy in 1807, which resulted in the isolation of sodium and potassium, the commercial utilization awaited the discovery of an adequately cheap source of available electrical energy which was realized on the invention of the dynamo in

\* Proc. A. A. A. S., 44, 65-85; 1896.

1867. When its practicability was demonstrated, and especially after it had been shown that a head of water could be employed as the primary source of this energy, the electrochemical industry began and achieved such proportions that in the year 1900, in the United States alone, phosphorus, sodium, and other metals, not including aluminium, were isolated, and caustic soda, bleaching powder, and other bleaching agents, bromine and potassium bromide, potassium chlorate, litharge, graphite, calcium carbide, carborundum, and carbon disulphide, amounting in value to \$2,045,535, were manufactured by electrochemical methods. Many other products have been obtained by this means in the laboratory and have been expected in the industry; but while the industry is a growing one it is not growing as rapidly in the variety of its products as some have been led to anticipate. Much depends upon the extent to which low-cost sources of energy are to be commanded, and on this point the following from J. W. Richards' presidential address to the American Electrochemical Society in 1903 is pertinent. He says:

"Niagara falls is the most accessible of our great water-powers, and has therefore drawn into its fold the majority of our electrochemical industries. But another source of surplus power is distributed over a large part of our country in a condition at present as undeveloped as was Niagara's power when Columbus touched our shores. I refer to the surplus power from blast furnaces, obtainable by using gas engines. Every blast furnace burns its gases to heat its blast and to raise steam for its power. The two-thirds of its gases used for the latter purpose generate just about the power needed for the blowing engines, pumps, hoists, etc., an amount equal on an average to 2,500 horsepower for a furnace making 500 tons of iron per day. If the gas thus used was used in gas engines there would be an average surplus power, over and above all requirements of the furnace itself, of 10,000 horsepower. The gas-engine plant needed to produce this power does not cost over \$50 per horsepower investment. This compares favorably with the cost of developing water powers, which varies from \$25 to \$100 per horsepower. It is thus deducible that there are scattered

over the United States, in some of our most flourishing industrial centers, undeveloped powers which aggregate over 1,000,000 horsepower, which can be developed at no more cost than the average water power, can be generated just at the spots where they can be most favorably utilized, and without any more drain on our natural resources than the harnessing of a new water power, for not a pound of coal more would have to be burnt than is used at present.

"Other possible sources of power are the waste surplus gases from by-product coking ovens and the utilization of gas-producers, using cheap, almost waste, coal in connection with gas-engines. Power therefore is available in immense quantities in places and in countries not blessed with Niagaras in their midst, and the industrial development of such sources will be one of the most marked industrial movements of the next ten years."

While recognizing these many obligations to physics, as a *quid pro quo* technical chemistry supplies her devotees with all the "manufactured" materials which are the subject of their experiments and observations, or used in the construction of their instruments, or as sources of energy—such as coal gas, acetylene, alcohol, and others, and the substances used for primary and secondary batteries. Many physical topics have originated with or been extended by the technical chemist.

The technical chemist looks to the forester, the farmer, and the miner for his raw materials, but he returns to the former alkaloids, wood alcohol, acetic acid and acetates, acetone, formaldehyde, paints, rubber articles, and a multitude of other products of manufacture; he returns to the farmer starch, sugar, artificial manures with which to reinvigorate his soil, fibers bleached or dyed, the suint from his sheep, the pepsin, pancreatin, and antitoxines from his swine and cattle, and through the agricultural chemist specific directions as to methods for the treatment of his soil and his crops. Since Liebig began the investigations which resulted, in 1840, in his book on "Chemistry in its Application to Agriculture and Physiology," no one science has probably benefited more from the labors of the technical chemist than agricultural science; for

well equipped research laboratories with well organized forces of chemists have been devoted by legislation to this purpose to a greater extent than to any other, and the publications from Dr. Wiley's laboratory alone indicate how valuable this has proven to be. As one among many examples, we may cite the sugar industry, which owes its existence today in this country, whether the source be sugar cane or beet, or starch from maize or potato, to the technical chemist.

The technical chemist returns to the miner the metals isolated from his ores in the form of tools and machinery, or coins, or converted into compound substances available as medicines, as disinfectants, as detergents, and for a variety of purposes, and he supplies him with his explosives through which his labor is rendered much less arduous and his life more secure.

The technical chemist looks to the civil engineer to provide the means for the transportation of his raw material and his manufactured products, and to the mechanical engineer for his constructions and his machinery, but he supplies them with all the manufactured materials used in their work, and guarantees by analysis the quality and character of the natural as well as the artificial materials required. So rapid has this method of chemical supervision come into vogue in the last half century that the engineer, whether he is to build a hotel, a ship, a locomotive, a gun, or a bridge, to lay a concrete foundation, or to surface a road, now introduces into his specifications the chemical requirements which the material must satisfy in order to be accepted for use, and he depends upon explosives to enable him to drive his tunnels, sink his shafts, and remove obstructions from his course. It has excited no particular remark that a chemical laboratory has been established as a part of the preparations essential to the building of a tunnel under the Hudson River.

To the metallurgist technical chemistry has been invaluable, as it has improved the quality, decreased the cost, and increased the speed of production of his materials. The story is an interesting one as we follow it either among the precious or the common metals. As set forth by Bridge in the "Inside

History of the Carnegie Steel Company," where we trace the growth from the Kloman forge of 1853, worth, complete, \$4,800, to the Carnegie Company of 1899, valued at about \$500,000,000, the story is a fascinating one in many ways, but in none more than in such rivalries as that between the blast furnaces started by the Lucy and Isabella furnaces and entered into by the Edgar Thompson, the Carrie, and the Youngstown furnaces, by which the output of pig-iron was increased from 50 tons in each 24 hours to 901 tons in the same period, while the coke consumption per ton of iron was reduced by 50 per cent. No one with sporting blood in his veins but feels a thrill as he follows these records at the blast furnace, the Bessemer converter, the open hearth and the rolling mill, and especially as he realizes the tremendous issues involved and the enormous amounts of money at stake, and everywhere he finds it is only by the close and constant supervision of the chemist that these results could have been attained while the quality of the product was assured. The authority of the chemist in these enterprises has been extending over a continually widening territory and becoming more positively recognized; so that, taking again the blast furnace as an example, where at first he was occasionally employed to analyze the ore used or the pig-iron produced, he now analyzes all of the fuel, flux, and ore that goes in at the throat, and the gases, slag, and metal that are produced in the furnace. One has but to casually examine a modern technical work such as Harbord's Metallurgy of Steel to be convinced of the absolute dependence of the modern steel-maker upon the technical chemist. Mr. Carnegie admits that he owes his success in steel-making to having been among the first to employ chemists throughout his establishments; and we find that the other industrial combinations, such as the Standard Oil Co., Amalgamated Copper, and the like, which consider no detail of business too small to be ignored, employ chemists at all points, auditing their operations, accounting for their materials at all stages, stopping wastes, diminishing costs, improving the quality and increasing the speed of manufacture.

Technical chemistry, then, invades the domains of economics, of politics, and of diplomacy. A striking example of its effects in economics and politics is found in the settlement of the silver question. Gold is a most widely diffused metal. It has, for instance, been shown by assayers at the U. S. Mint at Philadelphia that if the gold in the clay of the bricks of which the buildings of the Quaker City are built could be brought to the surface, the fronts would all be gilded. In the past our processes for the isolation of this metal have been so costly that only the richer ores would bear treatment. Large bodies of low-grade ores which have been discovered and mountains of tailings carrying values were looked upon as worthless, while enormous quantities of copper, lead, and other metals containing gold were sent into the market to be devoted to common uses, because the cost of separation was greater than the value of the separated products. Eight years ago, when the "silver question" was made the national issue, while the orators were declaiming from the stump, the chemists were quietly working at the problem in their laboratories and factories. Manhé's process for bessemerizing copper ores was combined with the electrolytic refining of the product, so that even traces of gold were economically recovered, while the cyanide processes, such as the MacArthur-Forrest, the Siemens-Halske, the Pelatan-Clerici, and others for the extraction and recovery of gold from low-grade ores and tailings, were successfully worked out and put into practical operation to such effect that by the cyanide processes alone gold to the value of \$7,917,129 was recovered in the United States in 1902, which is more than was ever won throughout the whole world by all methods in any one year up to 1661, and probably up to 1701. The data for other processes is not at hand for 1902, but the returns for 1900 show that gold to the value of \$88,985,218 was recovered in the treatment of lead and copper ores in the United States, of which \$56,566,971 worth was recovered in refining. It has but recently been publicly proclaimed in this city of St. Louis that the "silver question" is settled, and it is settled, but it was settled largely through the efforts of the technical chemist and metallurgist.

Technical chemistry renders important services to medicine in furnishing it with an enormous variety of remedial agents, anesthetics, and other supplies. It is an important factor in the public-health service, supplying disinfectants and deodorizers, inspecting food supplies, supervising water supplies, devising methods for the purification of sewage, the treatment of wastes, and the prevention of the pollution of the atmosphere. We have but to mention the names of Pasteur and Pettenkorfer, of Letheby and Wanklyn, and of Drown, Chandler, and Mrs. Richards to emphasize the importance of the chemical factor.

Chemistry is an equally important factor in public safety. A glance at von Schwartz's "Fire and Explosion Risks" will show how varied and extensive but a single one of these fields of activity is. Every one of you as you came here by boat or rail owed a large measure of your safe conveyance to the technical chemist. The regular utilization of these valuable services in this interest is of quite recent date. It was in 1875 that some of the officials of the Pennsylvania Railroad Company, finding that the oil used in their signal lamps and headlights was unreliable, and that all empirical methods of examination failed, determined to employ a chemist. Dr. Charles B. Dudley was called, a laboratory was opened at Altoona, and in the face of the skepticism of the "practical" man, the work began and was carried to so successful an issue that a multitude of problems relating to railroad administration have been referred to the chemist, his force of skilled assistants has been steadily increased, and the position of the chemist in the organization is second to none in importance. Other railroad companies, recognizing the gain in economy and efficiency, have also instituted chemical laboratories, until in 30 years it has become common practice. While the Pennsylvania Railroad Company was wrestling with the question of testing oil, the U. S. Light-House Board was having trouble from the same cause, the lamps in the light-houses and beacons along our coast, harbors, and navigable waters having become quite unreliable from the character of the oil furnished, and it, too, sought the aid of

the chemist, with such result that it has ever since relied upon chemical science to define and pronounce upon the quality of its supplies.

It has been said that the state of civilization of any country may be determined by the amount of soap which it consumes. Lord Beaconsfield considered that the condition of the chemical trades constituted the best industrial barometer. In his pamphlet on "The American Invasion, or England's Commercial Peril," when discussing "the best index of a nation's prosperity," B. H. Thwaite says: "Had he (Beaconsfield) selected the iron and steel trades, he would have made a far better choice." I have given these citations from the many at command as illustrating the tribute paid by the thoughtful to technical chemistry. Technical chemistry promotes civilization, profoundly modifies national policies, and influences diplomatic proceedings. The most frequent cause of friction between nations today is found in the endeavor of each of the world powers to control territory for the exploitation of their products or as sources of their raw materials.

Technical chemistry, as practiced in the past, from the dawn of manufacture, is a most important subject for consideration by the anthropologist, which has unfortunately been too much neglected. Its study will bring rich yields to the anthropologist who comes to it with the proper preparation, for he will find in the arts embraced in technical chemistry the best gauge of the extent of civilization of a people. Historians agree that no one material thing has more profoundly influenced civilization than gunpowder has. Over fifty years ago, under circumstances somewhat similar to those which obtain here, a body of scholars under the leadership of Dr. Whewell, Master of Trinity College, reviewed the results of the famous exhibition which had just been held in London. I desire to call the attention of the anthropologists to the address there given by Sir Lyon Playfair on the "Chemical Principles Involved in the Manufactures of the Exhibition."

In the autumn of 1874 I was so fortunate as to be the guest, at his residence in the Smithsonian Institution, of Joseph

Henry, its first secretary and executive officer from 1846, and I had the precious privilege of hearing from his lips a most detailed account of the development of the institution from the time when he was assigned the duty of devising and carrying out the plans by which Smithson's wishes should be realized and the provisions of the legislative act creating the institution complied with, and particularly of the various obstacles which he had encountered and surmounted in his endeavor to use the fund for "the increase and diffusion of knowledge among men" in the spirit in which Smithson, as Henry understood it, intended it should be used. Naturally my interest in this famous institution was greatly quickened, and I have watched somewhat more keenly the subsequent career of this institution, and of the organizations such as the Library of Congress, the U. S. Department of Agriculture, the National Museum, and others created or fostered by it. From the outset, however, I have remarked upon the absence from the Museum of any collection relating to technical chemistry, which is so profoundly connected with the history and development of civilization, and which has undergone itself, in its development, so many changes that its tools and appliances and methods disappear completely from view unless preserved in some such historical collection as those made by the museums I have endeavored, by suggestion, to have this oversight remedied, but have been met by the reply that the present building is overcrowded and its resources overtaxed by the mass of material collected in branches at present cultivated. As now the Museum is starting on a new career of usefulness and a new structure of greatly increased capacity is being built, this seems an opportune time to publicly seek this recognition for industrial chemistry, at least in the anthropological collections, and particularly when, as now, to a greater degree than at any other period, such rapid changes are going on in long established and important industries, such as the sulphuric acid and the alkali industries, that the processes of the last century may become among the lost arts of the next century.

Within the present year the remains of Smithson have been removed from the soil of Italy, in which they so long rested, and been reverently and fittingly interred within the confines of the noble and beneficent institution that he founded. The revival of personal interest in Smithson which this removal has aroused has led to the suggestion that a monument be erected to his memory. The Smithsonian Institution is itself an enduring monument; but if another be created, could it not, considering that Smithson was a chemist, fittingly take the form of a chemical collection in the Museum which so long benefited by his bequest.

#### IV.

### THE PROGRESS AND DEVELOPMENT OF CHEMISTRY DURING THE NINETEENTH CENTURY.\*

BY FRANK WIGGLESWORTH CLARKE, SC. D.,

Professor of Mineral Chemistry.

The history of any science is a record of progress from empiricism to philosophy; from isolated details to systematic knowledge. At the outset, certain facts impress themselves upon the minds of men, either because the observed phenomena are beneficial, or for the opposite reason. Between the facts, the simpler and more obvious relations of cause and effect are first noted, but only in the most superficial way and without deliberate intention. By degrees, after many wanderings along paths that lead nowhere, and in spite of countless misinterpretations, mankind slowly accumulates a mass of data in which something like unity begins to appear, and through which it is seen that the universe is not a creature of caprice, but an existence organized and orderly. This conception lies at the foundation of all science; it is the one article of faith which the student dares not doubt; for rational investigation would be impossible without it. The belief in order, and the hope that we may discover its laws, inspire all scientific researches.

Speaking broadly, the development of science takes place in three stages, which merge one into another and often overlap. First, there is the collection of data, classification follows, and attempts at interpretation come last of all. This is the logical course, which, however, is not always followed. Premature speculations, efforts to determine what the universe should be, are not unknown in the history of human thought, nor have they been altogether futile. Hypotheses, framed in advance of positive knowledge, help to stimulate investigation,

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\* Prepared for and read at the International Congress of Arts and Science, St. Louis, September 23, 1904.

and so, despite their errors, lead us ultimately to the truth. In reality, the three stages of growth coexist; experiment and speculation go on side by side; and each one reinforces the others.

At the beginning of the nineteenth century, chemistry was in a transitional, I might almost say a formative, period of its existence. It was just emerging from the morasses of a philosophy unchecked by experiment, and from the vagaries of the alchemists, and was assuming something like its present form. A goodly mass of data had been gathered; they were partly classified, and the work of interpretation was successfully begun. The analyses of air and water, the discrimination between elements and compounds, and a recognition of the constancy of mass, had laid the foundations of the new science. This word "new" I use advisedly. In its earlier days chemistry was only an empirical art, in which discoveries were made by chance, and remembered because of their utility. Chemical facts were secrets in the hands of artisans, or held by initiated priesthods; and when they were recorded at all it was only in the form of useful recipes or as medical prescriptions. As a science, as an organized body of knowledge with a philosophy of its own, chemistry hardly existed before the time of Boyle. Alchemy, groping in the darkness, had made useful discoveries; but their successful correlation was an affair of a much later period. To Lavoisier, more than to any other one man, the transformation of chemistry from an art into a science must be ascribed. These were greater discoverers than Lavoisier, perhaps, but he was the organizing spirit, and his proof that matter was indestructible made quantitative chemistry a possibility. Without such a basis a rational science would be almost inconceivable. It is a necessary complement to the older philosophical maxim that from nothing nothing can be made. Creation and destruction are equally beyond our powers—a truism which the ancients may have apprehended, but which before the time of Lavoisier rested on speculation alone. Indeed, the conception was defective until the middle of the nineteenth century, when the doctrine of the conservation of energy raised it to completion.

Let us now return to the opening of the century and see how matters stood. The simpler gases, acids, and bases and the

commoner metals were known, and many compounds had been more or less completely examined. Richter and Fischer had shown that reactions took place in proportions which exhibited simple relations to one another; the doctrine of phlogiston had ceased to dominate chemical opinion, and the law of definite proportions, despite the opposition of Berthollet, was generally received. That chemical changes should be governed by fixed quantitative laws was a natural condition to expect, but it needed both proof and explanation. So many reasonable theories had already broken down, that a healthy skepticism prevailed, and chemists demanded concrete evidence in favor of every proposition that philosophy might offer for their edification. Rubbish had been cleared away,—what structure should rise in its place? An answer to this question was speedily forthcoming.

It was in October, 1803, that John Dalton published the first germ of his famous atomic theory, but it was not until five years later that he gave it completely to the world. Merely as a speculation, the idea of atoms was as old as philosophy; but in its scientific form it was something entirely new. Under it, the law of definite proportions became necessary and significant; the law of multiple proportions, which had been partially anticipated by others, was made complete; and these considerations alone would have justified the provisional acceptance of the doctrine. It unified the known or suspected laws of chemical combination and gave them philosophic validity. It incited chemists to verify the evidence in its favor, and so led to new discoveries; in short, it fulfilled all the conditions of a good scientific theory. Its chief peculiarity, however, its prime difference from all preceding atomism, remains to be stated. Dalton discovered that to every element a single definite number could be assigned, and that these numbers or their multiples governed the formation of all compounds. Oxygen, for instance, unites with other elements in the proportion of eight parts by weight or some multiple thereof; never in other ratios. These combining numbers, under Dalton's theory, became the relative weights of the atoms; and atomism, hitherto a qualitative notion only, received a quantitative expression. With the help of these atomic weights, or combining numbers as some

anti-theorists preferred to call them, the composition of any substance could be represented by a simple formula; and chemical calculations, which had been empirical and arbitrary, became systematic and easy. In short, Dalton had discovered a new class of constants, the fundamental numbers of quantitative chemistry, whose significance has steadily increased and is probably not even yet completely appreciated. To this point I shall recur later.

The decade following Dalton's unique discovery was chiefly characterized by two lines of research, the study of inorganic compounds and the investigation of their physical relations. Davy, by decomposing the alkalies and earths, gave precision and definiteness to the conception of a chemical element, while Gay Lussac and Avogadro discovered the laws which connected the volume relations of gases with their chemical composition. To Avogadro we owe the discrimination between atoms and molecules—a distinction which physics, unaided by chemical evidence, could probably not have reached, and which even now is often overlooked by physicists. Maxwell, for example, in his article upon atoms in the *Encyclopedia Britannica*, deals with molecules throughout, and fails to mention Dalton's work at all. To Maxwell the physical arguments were clear, the chemical relations were not adequately appreciated.

In 1819 Dulong and Petit discovered the law connecting the specific heat of a solid element with its atomic weight, but apart from that investigation chemical research became for thirty years largely a matter of detail. Discoveries were many, successful generalizations were few. During this epoch, Wöhler, by his synthesis of urea, broke down the barrier between organic and inorganic compounds; Liebig and others proved that groups of atoms, the so-called compound radicles, could play the part of pseudo-elements; Dumas established the principle of substitution, and Faraday connected the phenomena of electrolysis with the atomic constants. Inorganic chemistry, however, received the lion's share of attention, and the commanding figure of the period was that of Berzelius. To him we owe the development of chemical formulæ and equations, the thorough determination of many atomic weights, the discovery of new elements, and the investigation of innumerable

compounds. And yet his gigantic labors were performed in a laboratory which a modern high school would despise, and in which the chemist of today would be able to accomplish next to nothing. It was in fact a kitchen, wherein cookery and research were carried on almost side by side. Had Berzelius possessed our wealth of resources, could he have achieved a greater success? Perhaps not, for we must remember that he had a virgin field to cultivate, and the implements of the pioneer are less elaborate than those which his successors require. A great part of the work done by Berzelius was necessarily crude, and much of it is still awaiting revision, for the man who clears the ground is not the one to give it the highest cultivation. As knowledge grows, the demands for facilities increase, and we could not return to primitive methods even if we wished to do so. Imagine a modern astronomer with Galileo's telescope, and no more mathematics than Kepler could command! Berzelius labored in the days of small things, and being great he overcame the obstacles that confronted him; we today are the slaves of a complexity such as the earlier chemists could never have imagined. I refer now to the material side of science; in its theoretical aspects simplicity has been gained and our range of vision has widened correspondingly. We work in clearer air and with much more powerful appliances than the investigators of earlier times, but to say that we do better would be rash indeed. There are giants in all days, and no age has a monopoly of greatness.

During the Berzelian period, as I have said, inorganic chemistry was the main subject of chemical research. But it was not the only theme, for chemical physics also received a good deal of attention, and organic compounds were by no means neglected. Inorganic substances were apparently simple, the organic were complex; and so the former were naturally considered first, the more obvious problems taking precedence over the less evident. By degrees, however, opinion changed, and the great discoveries of Wöhler, of Liebig, and of Dumas, the theoretical discussions of Laurent and Gerhardt, and perhaps also the physical regularities pointed out by Kopp, turned the current of research into a new channel. Substances that could be arranged in series, with progressive differences in

composition and properties, were evidently worth examining, a compound radicle was, in its way, as fascinating an object of study as a new element; the possibilities of substitution and the marvelous chemical plasticity of organic matter were noted, and all of these considerations worked together in effecting a transformation of chemical thought. Organic chemistry became the fashion, and for nearly fifty years it was the central subject of research.

Before entering upon this new period let us go back and examine the conditions under which progress had previously been made. How was the work done, and what impulses urged it forward? What purposes, what demands, what encouragement led chemists to pursue their labors? At first, chemistry was a branch of the older natural philosophy, and the discovery of natural laws, the reaching after truth for its own sake, was the chief aim of investigators. These, as a rule, were individuals, working independently, each on his own resources, and without thought of practical results. Science and industry were as yet unallied; chemistry had but a small part in schemes of education; institutions for the aid of research were few, and those which did exist were scantily endowed. Davy, to be sure, had the Royal Institution behind him, and in it he discovered Faraday; Berzelius was secretary of the Academy at Stockholm; but these were exceptional cases, and not by any means the rule. Personal initiative and voluntary effort were almost the sole agencies at work. The great discoveries were made by amateurs, by men who among other labors found some leisure in which to study; and only the occasional man like Cavendish, with ample means, could give his whole time to research. Priestley was a clergyman; Scheele an apothecary; Lavoisier a public official, and these are typical examples. The impulse to investigate came from within, uninfluenced by thought of profit or by any manner of external compulsion. An inspiration, not the pressure of a duty, drove our predecessors forward.

By degrees, however, chemistry was found to be useful, and the commercial demand for chemical services began. Manufacturers discovered that processes and products could be improved, and that waste material had value; metallurgy developed along chemical lines, medicine gained new remedies, and

agriculture was turned from its traditional empiricism into scientific courses. A new set of impulses was given to chemistry, and many of its practitioners became professional in expectation of material profit and reward. The field of research was widened, and civilization was thereby advanced. Chemistry was not merely a philosophical amusement, but an agent for "the betterment of man's estate"; and so a double motive existed for its further development. This combination of intellectual interest and utility gave the science a higher place in educational affairs; and when Liebig opened the first university laboratory for students at Giessen, a new era for chemistry began. Before that time the chemist was either self-taught or trained in private laboratories; now he could aspire to scholastic honors and assume his proper position as a learned man. As a discoverer, Liebig was great, but his chief services to chemistry were in his educational work and in the application of science to agriculture. To those achievements his wide reputation is mainly due.

For chemistry, then, the second half of the century opened auspiciously. Chemists were needed for technical purposes and as teachers, and resources were placed at their disposal almost without stint. Discovery was stimulated, investigation became more systematic, theory and practice developed side by side. Practical applications followed the most abstract researches; new industries sprang into existence, and in education mere bookishness gave way to experimental methods. A great but silent revolution had taken place, whose magnitude will be better appreciated by posterity than by ourselves. Had science done no more than to replace supposition by experiment, and chance discovery by orderly research, the revolution would still have been one of the greatest in the history of mankind. Chemistry was not the sole agent in effecting the transformation, but it surely played one of the leading parts.

All of the agencies which I have mentioned helped to encourage the study of organic chemistry. It was systematic, and therefore easily taught, and it was full of suggestiveness both for teacher and pupil. Its practical applications were many, and gave the investigator hope of material rewards; the revelations of coal-tar alone were enough to stimulate chemists

to the greatest activity. So it happened that inorganic chemistry fell into neglect, and the majority of chemists followed the leaders into the new field. The conceptions of chemical structure, which had been slowly evolving during many years, were given definiteness by the discovery of valence, and of this the benzene theory was perhaps the most brilliant application. Frankland, Williamson, and Perkin in England; Dumas and Wurtz in France, Kekulé and Hoffmann in Germany, and the Russian Butlerow, are the conspicuous names connected with the modern movement. Organic chemistry became an imposing structure, and yet it rested upon the foundations which the older chemists had laid. The constitutional formulæ were built upon atomic conceptions, valence itself was a property of the atom, and complete acceptance of the new ideas was impossible until after Cannizzaro had revised the atomic weights and brought them into harmony with Avogadro's law. Up to that point there was a chaos of rival doctrines, afterward order reigned. The full significance of valence could not appear until the old system of chemical equivalents had been set aside.

Naturally, as the mass of chemical data increased, specialism became necessary. No man could expect to know the whole of chemistry; a small part of it was all that any one could handle, and the inevitable results followed. A specialist may be broad, but the direct tendency of specialism is to narrow one's field of view, and to concentrate the attention upon details rather than generalities. The theories which fit immediate conditions then become satisfactory, and the chance that they may be only partial glimpses of greater laws is disregarded. Only the stronger and more philosophical minds can escape these limitations and see things in their larger aspects.

To the organic specialist, at least in most cases, the doctrine of valence was adequate; for it explained the combinations with which he had to deal. Relatively few of the chemical elements were seriously considered by him, and they offered no insuperable difficulties. Carbon was the typical element, the key to all organic matter; its quadrivalency in terms of the hydrogen unit was assured; its ability to unite with itself in chains or rings was established; with these data constitutional formulæ became truly significant, and useful for the correlation of exist-

ing knowledge. Even more can be said in their favor, for they had a certain prophetic ability which guided research and foretold discovery. But, after all, carbon was only one among many elements, and nobody was justified in assuming that its modes of combination represented general laws, or that ideas drawn from the study of organic matter alone were applicable elsewhere. The theory of valence must be tested with regard to all the elements before its full validity could be recognized, and that test implied a renewal of interest in inorganic problems. It was necessary to discriminate between special cases and fundamental principles, and so a much larger field than organic chemistry could offer had to be surveyed. Clues had been found in the study of carbon compounds; but where were they to lead?

So far as actual knowledge went, the chemical elements were distinct entities, and speculation as to their nature had been looked upon generally with disfavor. And yet they had points in common which rendered their classification possible, and it was perfectly evident that they could be arranged in a small number of natural groups. Certain elements were obviously types of others; some were isomorphous, as shown by Mitscherlich, and some exhibited serial relations as in Döbereiner's triads; but no one scheme of classification covered the entire ground. Analogies were numerous enough, but their meaning was not clear. A process of evolution was at work, however, and in due time it culminated in Mendelejeff's development of the periodic system. All partial classifications, all the dim foreshadowings of law now fell into place together, and one simple generalization occupied the field. The atomic weights became more than ever the fundamental constants of chemistry, and all the properties of the elements were seen to be periodic functions of these quantities. In Mendelejeff's table stress was laid upon valence and the form of compounds which each element could yield; in Lothar Meyer's curves the physical relations were emphasized, and so each statement reinforced the other. Newlands, it is true, had partially anticipated Mendelejeff, but his law of octaves fell just short of completeness.

At first, the periodic classification attracted comparatively little attention, and its general acceptance might have been slow had it not been for certain prophecies. In Mendelejeff's table there were many gaps; these were attributed to the existence of elements as yet unknown, and for three of them the author ventured upon predictions. Each element must have a certain atomic weight, a prescribed density and melting point, and should form compounds of a stated character. In due time the three unknown elements were actually found, and gallium, scandium, and germanium confirmed all of Mendelejeff's anticipations. The importance of the classification was thus established, and the periodic law became one of the foundation stones of modern chemistry. The conception of valence as a property of the atom acquired a broader significance; in cases that had been doubtful its magnitude could be determined, and with its aid the chaos of inorganic chemistry began to exhibit signs of something like order. The deficiencies of the periodic system I need not mention here, for this is no time for details; neither shall I discuss the obvious difficulties which arise when we seek to apply the doctrine of valence to inorganic compounds; only the larger verities concern us now. In the broadest sense the periodic classification is sound; the principle of valence is general, and the obstacles which now appear will doubtless be overcome by future investigation. That the greatest generalization has been reached, we cannot assume; but so far as we have gone we stand on solid ground, and can continue our explorations in safety.

Up to a certain point organic compounds had been successfully interpreted in terms of valence. Isomerism was explained, and the existence of unknown isomers could be predicted; different atoms were assignable to different positions within the molecule, as in the case of the four hydrogen atoms of acetic acid, one fixed and three replaceable; but after all this had been done there were still some difficulties outstanding. Isomers existed whose chemical structure seemed to be the same, and for their interpretation an extension of chemical theory was needed. This want was supplied by Van't Hoff and Lebel, who almost simultaneously pointed out the consequences of assigning a tetrahedral form to the atom of carbon.

From the properties of such an atom a new class of structural formulæ could be deduced, by means of which the so-called cases of "physical isomerism" were simply interpreted. The molecules of tartaric and racemic acids, for example, resemble each other as an object resembles its reflection in a mirror, the one being a reversal of the other. Our science acquired a new province, that of stereochemistry, which in less than thirty years has grown to impressive dimensions. The theory of Van't Hoff and Lebel did more than to interpret the troublesome known phenomena, it encouraged additional research and led to many discoveries. At first, the asymmetric carbon atom alone was considered, but its peculiar properties are now shared by other elements, and physical or stereochemical isomers are found even among inorganic compounds. When one atom is combined with four other atoms or groups of as many different kinds, optical asymmetry appears, and physical isomerism becomes possible.

During the ninth decade of the century the dominating interest in organic chemistry began to wane, for the reason that other subjects were demanding their share of attention. I do not mean by this that the activity of organic chemists diminished, for their output of discovery was never greater than now; but the center of the stage was slowly being filled by other groups of actors. Inorganic chemistry was reviving from its long neglect, and physical chemistry loomed large upon the horizon. In each of these branches journals were started, and no difficulty was found in filling their pages with the records of successful investigations. In theory, physical chemistry has made the greatest advances, inorganic research has been more a matter of detail. Let us briefly consider the two themes separately.

To the inorganic chemist several duties were apparent. Old work needed revision, the compounds of many elements were almost undescribed, there was a lack of system to remedy, and the theories derived from organic chemistry were to be tested and applied. A very large part of the work was necessarily descriptive, a preparation for the future, but back of it all lay a fundamental question with which all physical science is connected, for the nature of matter itself was to be determined.

In its broadest sense this question demands the coöperation of all science and all philosophy, but to inorganic chemistry one phase of it may be assigned. What is the nature of the chemical elements? Are they one or many? And how shall an element be defined? To these questions there is as yet no final answer, but clues to follow are many, and some of them are offered by the periodic law. To remedy its imperfections is an obvious duty for inorganic chemists to perform.

Near the middle of the Mendelejeff table and of the Lothar Meyer curve there is an area which is partly blank and partly filled with the symbols of uncertain elements. That some of them were tri- and others quadrivalent was well established; but their number was undetermined, and the places which they should occupy were even more doubtful. Some of the uncertainties still remain, and some have been cleared away; but the main problem is as yet unanswered, and therefore the metals of the rare earths are still actively studied. Supposedly definite earths have proved to be mixtures; others, like cerium, lanthanum, yttrium, and scandium, seem to be definitely placed; but what shall we say of the rest? Didymium was thought to be a distinct element, and yet it has been split in two; samarium, gadolinium, erbium, and ytterbium are probably definite; but several other metals are claiming recognition; and so, notwithstanding the progress which has been made, a large part of the field is still obscure. Through the study of the rare earths, one side of our problem, the nature of the elements, is open to attack; but only the outworks have been carried so far.

According to modern ideas, the integrity of an element is determined by two conditions; it must have a distinct spectrum and a definite atomic weight. In the study of the rare earths these criteria have been systematically applied, and to great advantage; but what has been done elsewhere? To answer this question we must go back more than forty years in time and make a new beginning.

It was near the middle of the century that August Comte, seeking to find some limits to positive knowledge, argued that it would be impossible for us ever to determine the nature of the heavenly bodies. Are they composed of matter like that

which forms the earth, or are they different in kind?—on that theme we might speculate, but we could never know. The prophecy was futile; Kirchhoff and Bunsen, with the spectro-scope, swept the limitations away, and all the universe, as far as eye could reach, was found to contain familiar elements, but under conditions not always like our own. Astronomy, physics, and chemistry had gained a new weapon, and discovery followed discovery along widely different lines.

In the chemical laboratories the value of the new instrument was immediately proved. Two metals, caesium and rubidium, were presently discovered by its aid, thallium and indium were found a little later, and their analogies to other elements made them comparatively easy to classify. The periodic system, which was developed later still, gave them their proper positions among the metals, and they in turn made the classification more complete, and therefore easier to establish. In each case the double criterion was applicable, and definite spectrum was connected with definite atomic weight. I speak now of emission spectra; but they are not the only kind. Certain solutions give absorption spectra, and they have been of great assistance in the study of the rare earths. In the identification of the elements, then, the spectro-scope has rendered service of inestimable value, and discovery would have been very slow without it. Quite recently, at the very end of the last century and during the few years of the new, relations have appeared between the wave lengths of the spectral lines and the atomic weights of the elements; but the general expression which shall connect them all is yet to be revealed.

Another discovery in the realm of inorganic chemistry is deserving of mention now on account of its peculiar significance. The atmosphere was thought to be well known, and yet, in 1895, a new element, argon, was discovered in it. This find was quickly followed by others of like kind, and now five gases previously unknown have been extracted from the air. Each gas is identifiable by its spectrum and its density, and from the latter datum the atomic weight can be inferred.

Now the interesting fact concerning these atmospheric gases—helium, neon, argon, krypton and xenon—is that they represent matter of a new kind. So far as evidence goes, they are

monatomic, absolutely inert, and incapable of union with other elements. Their valence is zero, and when the periodicity of the elements is represented by a vibratory curve, they occupy the points of rest,—the nodes. They are matter having physical, but no chemical, properties, and therefore they can be investigated only upon the physical side. This conclusion, perhaps, should be stated provisionally, for it may be reversed by future discovery; but of this possibility we have only one suggestion. Helium was first extracted from the mineral uraninite, in which it is firmly held, and we can not say with certainty that it is not chemically combined. Altered or massive uraninite contains little or no helium; the crystallized varieties yield more, and the most brilliant and perfect crystals are the richest of all. The gas may be merely occluded, but the bare chance of combination should not be overlooked. Either supposition is legitimate; but there is still one more possibility, namely, that helium may be generated by the decay of another substance, and not be an original constituent of uraninite at all. Here we touch the mystery of radium—a body which challenges our former conceptions of an element, for seemingly it can be decomposed.

The discovery of radium by Mme. Curie belongs to the nineteenth century, and therefore it falls within the scope of this essay. How it was found, how laboriously the phenomena of radioactivity were observed in order to isolate traces of the new metal, we all know, and the details need no repetition here. At last pure salts of radium were obtained, and the two criteria of spectrum and atomic weight were satisfied. Radium is clearly a metal of the barium group, it fills a definite place in the periodic table, its claims to elementary rank are on a level with those of other elements, and yet it exhibits an apparent instability which is difficult to explain. Radium gives off material emanations that are different from itself; they are gaseous and inert; in them the spectrum of helium has been observed. From one element another seems to be derived, and all our notions of what an element should be are thrown into temporary confusion. I say "temporary," for I believe that order will be restored, and that a deeper insight into the constitution of matter is close at hand.

Pardon me now if I seem to wander from one part of my subject to another. Between the various departments of knowledge there are no sharp boundaries, and the solution of a problem often depends upon the convergence of testimony from many different directions. The nature of the elements is primarily a question for the inorganic chemist; but physics has much to say upon the subject, and even the serial relations of organic compounds offer suggestive analogies which are entitled to some consideration. The periodic system, with its fulfilled prophecies, tells us that the elements are related one to another by some distinct law; the spectroscope gives us evidence of a different order; electrical phenomena have their share in the story, and the modern phenomena of radioactivity offer the latest testimony of all. What conclusions seem to be foreshadowed by the data now in hand?

One of the earliest achievements of the spectroscope was the rehabilitation of the nebular hypothesis. The resolution of some nebulae into clusters of stars had shaken faith in Laplace's speculation; but when it was proved that others were really clouds of incandescent gas, belief in the hypothesis was restored. One point, however, was of peculiar interest: in the nebulae only one or two elements, low in the scale of atomic weights, could be seen; in the whiter and hotter stars a few more substances appeared; colored stars were of still greater complexity, and so on progressively from the simplest constitution to the material heterogeneity of our globe. If suns and planets were evolved from nebulae, it seemed as if the chemical elements had been successively generated at the same time—a supposition which was certainly legitimate, although it was at first denied by some chemists as unworthy to be heard. At all events, here was testimony bearing upon the problem of the elements, although its full significance was not so clear. It could be pigeon-holed, but not thrown away.

Recently, and in great part through the researches of J. J. Thomson, evidence has been obtained of the reverse order. On one side an evolution of the elements is apparently indicated; Thomson's experiments suggest a breaking down. By studying the ionization of gases, phenomena were observed which point to the existence of particles smaller than the Daltonian

atoms, and a beginning has been made toward the identification of matter with electricity. The negative particles, corpuscles or electrons, have been split off from ordinary matter, and they are always the same, regardless of the element from which they separate. Even their mass can be estimated, and it appears to be about the thousandth part of that which represents an atom of hydrogen. These conclusions are perhaps not final, but they are emphasized by the results obtained in the study of radioactivity. The investigations of Rutherford and Soddy, of Ramsay, Dewar, and others, all tend in the same direction, and lead to the suspicion that the atoms are complex and subject to decay. The three most radioactive elements are radium, thorium and uranium, and these have the highest atomic weights of any substances known. If the elements are complex, these are the most so, and therefore presumably the least stable. If we take this testimony in connection with that given by Thomson, the evidence offered by the spectra of the heavenly bodies, and the regularities of the periodic law, we have a strong argument in favor of the supposition that the so-called elements are not the simplest forms of matter, and that they may be ultimately one. The doctrines of unity of matter and the unity of force are thus philosophically allied, and only negative evidence can be adduced to support a belief in the actual diversity of the elements.

Speaking broadly, organic and inorganic chemistry, at least as they are commonly studied, are essentially descriptive in their character, and they deal with statical phenomena. Physical chemistry, on the other hand, is more concerned with dynamics, and seeks to determine the conditions of chemical equilibrium, and the nature of chemical change. What substances are and what substances do are of course only two phases of the same fundamental problem, which are separable ideally, but not otherwise. Descriptive chemistry lays stress upon one side of the science, physical chemistry emphasizes the other; but they blend together by imperceptible degrees, and no clear line of demarkation can be drawn between them.

Every science, when viewed historically, is seen to have a central line of growth, to which its various branches are naturally related. In chemistry this line is marked by physical

phenomena, and from their study the greater generalizations have been derived. Avogadro's law, the law of Dulong and Petit, Faraday's theory of electrolysis, and the periodic classification of the elements are good illustrations of this principle. The atomic theory itself, which connects all of the other relations, is fully as much physical as chemical; valence is best explained in electrical terms, and stereochemistry arose from optical and crystallographic considerations. Physical chemistry is the main stem of our science, and statical conditions are merely the results of dynamical equilibrium. The description of a product is incomplete unless we have noted the physical phenomena, the transformations of energy, which took place during its formation, and to studies of this kind the chemists of the future must devote a large part of their time.

During the last twenty years the importance of physical chemistry, or rather the recognition of its importance, has steadily increased, and today it seems to dominate the entire field of chemical research. Laboratories are equipped for its purposes alone, journals are devoted to it, and the activity of investigators has become so great that subdivision has already begun, and men are known as thermo-chemists, electro-chemists, and so on. Electro-chemical societies have been formed and are prosperous; specialism is passing into subspecialism; in short, chemistry is swiftly assuming an entirely new form.

In the evolution of any science, successes and disappointments are almost equally influential; the former stimulating, the latter tending to arrest research. The fruitful line is followed, and attracts workers; the barren field is deserted or nearly so. Barrenness, however, may be due not to lack of fertility, but to premature effort; and the truth which is beyond our reach today may drop into our hands tomorrow. Thermo-chemistry, for example, has so far failed to repay the labor spent upon it, and has fallen into disfavor; but the future may tell a different story. Its importance is obvious, and its general laws can not elude discovery forever. The thermal changes which accompany all chemical reactions must some time be interpreted.

On the other hand, success has followed the physical study of solutions, and thereby chemical theory has been enriched.

First, it was found that substances in solution exerted pressure—a phenomenon attended by depression of the melting point and increased temperature for boiling. This pressure resembled that observed in gases, and a relation between the two was apparent. It was Van't Hoff's privilege to trace the connection, and to develop a kinetic theory of solutions. Avogadro's law was completely paralleled, and equal volumes of solutions at equal osmotic pressures were shown to contain equal numbers of molecules. For both laws, the liquid and the gaseous, however, there were certain apparent exceptions, which, for gases, were easily explained as the result of dissociation. Arrhenius applied this explanation to the exceptional solutions, taking into consideration also the ionic conceptions developed in the study of electrolysis, and the abnormalities vanished. A salt in dilute solution is electrically dissociated into its ions, which remain in equilibrium although separate. From these generalizations several important consequences followed. First, it became a simple matter to determine the molecular weights of soluble substances—a class of measurements that had previously been possible for gases alone. Secondly, much light was thrown upon the subject of reactions between dissolved salts, especially such as involve precipitation or double decomposition. In most cases, although not invariably, the phenomena are ionic, and the molecules are first broken down. In the third place, the uniform heat of neutralization between acids and bases was explained by showing that in all cases it represented one and the same change, namely, the union of hydrogen and hydroxyl ions to form water—a conclusion which gave a significant datum to thermo-chemistry. In brief, many distinct lines of physico-chemical research converge in the kinetic theory of solutions—a theory whose development has hardly more than begun. Like most successful theories, its importance may at first be exaggerated; we have not yet the perspective which shall enable us to judge it truly; in all probability, it is but one phase of some larger law; but, notwithstanding all difficulties and all objections, it is a stride forward, and will bring us to new truth.

We now reach a point where it is difficult to disentangle the many threads of investigation, and to determine their relations

to one another and to the past. Current work is more or less confusing, for it is too near our eyes, and its ultimate significance is not easily apprehended. The theory of solutions, the law of mass action enunciated by Guldberg and Waage, and the phase rule of Willard Gibbs interact in so many ways, and are so rapidly developing, that I for one dare not attempt to predict what the outcome shall be. Chemistry is becoming more and more a mathematical science, and so is gaining in precision; but mathematical reasoning leads to correct conclusions only when its premises are secure. The data must be verified and reverified before we can certainly determine their meaning, and in the enthusiasm of new investigation this necessary duty is often deferred. The pioneer leaves much undone behind him, and patient laborers are needed to follow in his lead. The first glimpse of truth is rarely the whole truth, for that is best gained by what we may call the method of successive approximations.

If prophecy is difficult, retrospection is easy; we may therefore retrace our steps and see what road we have followed. Boyle, Priestley, Scheele, and Lavoisier prepared the way for Dalton, and his atomic theory, the first quantitative theory of its kind, has been for a century the key to all chemistry. All of the great advances in our science have hinged directly upon Dalton's conception, and his atomic weights, as developed by Berzelius and Cannizzaro, are now seen to be fundamental constants, with whose aid the physical relations of different substances are easiest interpreted. The periodic law is based upon the atomic weights, valence is an atomic function, in stereochemistry we have a hint of atomic form, isomerism is intelligible only upon the assumption of variable atomic position, and the structure of a molecule depends upon atomic groupings. The ions of physical chemistry and the molecules of thermodynamics are either atoms or groups of atoms; and, in short, whichever way we turn in physical science we find ourselves, consciously or unconsciously, thinking in atomic terms. And yet we are sometimes told that the atomic theory is outworn, and that some other conception should replace it. We may well ask, therefore, whether atomism has any basis in reality.

Is it the truth or only an illusion—a concrete fact, or misinterpretation of testimony?

That the atomic theory has rendered great service to chemistry, and that it correlates our positive data, is clear; but after all it is hypothetical, for no atom has been isolated and seen. The molecule and the atom are inferred from the properties of matter in mass; and if we need a theory at all, there is none other at hand. The attempts to evade it are agnostic in character, and are based upon the tacit assumption that it is unscientific to speculate upon ultimate questions, which, in the nature of things, can never be absolutely solved. We can observe and classify relations, but it is useless to ask what they mean. The phase rule has been suggested as a basis for our classification, and under it the different kinds of matter become different phases of something which we may or may not be able to comprehend. Perhaps I misrepresent the position of the anti-atomists; but if so it is because their statements are to my mind far from clear. If we object to the atom, we must object to the ether, for that is equally unknowable; we cannot divorce matter and motion, for they are never observed apart; in short, we must reconstruct all physical science and keep within the limits of things known. But is the agnostic position sound? Is not the imagination as truly an instrument of science as is the reason? May we never look forward and anticipate what is to come, shall we always observe and experiment without the help of ideals? To do so we must assume limitations where no limits can be seen, and the human mind refuses to work in that way. Speculation is the guide of science; an indispensable assistant in our exploration of the unknown; a good servant, but the worst of masters. Scientific methods differ from unscientific methods partly by their use of system, and partly in their employment of discipline as against unrestrained speculation.

That the atomic theory has been a useful tool no one can deny; but can we, in the light of present knowledge, imagine a universe without it? We see that matter differs in its properties from point to point, and all of our experiments end in records of these differences. But is not difference a proof of discontinuity? How could a plenum vary? Even the ether

itself, that mysterious medium which is thought to pervade all space, is now believed to have a granular structure, or, in other words, to be atomic. Several mathematicians have worked upon this phase of the problem with curious results; but their conclusions lie outside of my theme. The chemical atom alone concerns us now, regardless of its ultimate or physical nature, which may be exceedingly complex. The conception is so bound up with all modern chemical ideas that we can not abandon it if we would, so long as nothing better is offered us in its place.

The chemist, then, may legitimately claim that matter, as we know it, is made up of small, distinct particles, which, so far as they have been chemically analyzed, are of few kinds. These particles gather into clusters, through some form of attraction whose nature is still unknown, and in which differences of position probably represent differences of chemical structure. Allotropy and isomerism are thus explainable, two phenomena that are perhaps the same, and for which the atomic theory alone has offered any reasonable interpretation. But this is not all. Certain numerical constants, commonly known as the atomic weights, have been discovered, one for each element, which are fundamental for all quantitative chemistry and for an important part of physics. These constants are real; they represent definite, measurable relations; and in one form or another they will remain in use, apart from all changes in theory. Whether they are independent of one another is yet to be determined; there are indications that they may be connected by some mathematical law; and should such an expression, a quantitative periodicity, be discovered, it would go far towards enlightening us as to the real nature of the elements themselves. The exact determination of the atomic weights is therefore a matter of supreme importance and one bearing directly upon the profounder problems of chemistry. If the atoms are separable into electrons, the masses of the latter should bear some relation to the atomic weights and give us clues to their mathematical interpretation. Future investigations along this line are certain to be made, and we may fairly hope that they will prove successful.

The nineteenth century is often called the age of steam, and its latter half the age of electricity. May we not, with equal

propriety, name it the age of chemistry? During the passage of its years chemistry has developed from an art into a science, with a clear philosophy of its own, and with useful applications which affect all other sciences and many industries. A great university may now employ twenty chemists as teachers where fifty years ago there was barely work for one. Training in chemical research has become a recognized feature in higher education; the student is taught to think and investigate; the production of new knowledge is seen to be a distinct function of the teacher. Scholarship is now rated according to its fertility; and the man who merely knows, no matter how thoroughly, the work of his forerunners, is given a low rank in the thinking world. In the industries, chemical thought is translated into action, and so becomes doubly creative, yielding at the same time new knowledge and material wealth. Governments maintain public laboratories; it may be in preparation for warfare, for sanitary purposes, as aids in the enforcement of revenue laws, or for their own protection as purchasers of supplies; and so the usefulness of chemistry is felt along innumerable lines. The science advances with ever-increasing rapidity, and there are as yet no signs of slackening. What shall the future be? We can distinguish necessities and express our hopes, even if we cannot prophesy. An essay of this kind would have small value if it failed to offer any helpful suggestions for the work that is to be done.

In the realm of descriptive chemistry certain work is obviously needed and is therefore likely to be done. Part of this, and the least attractive part, is revisionary—a verification of the older data with the correction of venerable errors. On the inorganic side we may predict many advances, and some of the possible lines of research we have already considered. In order to complete the periodic table, the rare earths must be exhaustively studied, and the irregularities shown by iodine and tellurium, or by potassium and argon, ought to be explained. The problems of chemical structure which are offered by complex bases and acids and by double salts require elucidation, and here physico-chemical methods are likely to be most applicable. The correlation of chemical structure with crystalline form is

sure to receive much attention ; but what direction researches of this kind may take is not easy to foresee.

For organic chemistry I am hardly qualified to speak, at least not with regard to the more immediate urgencies. It is plain, however, to every one that there are large and important groups of compounds which await constitutional interpretation, the alkaloids and albuminoids being among them. Organo-metallic bodies also deserve a good deal of attention, for in them the two departments of descriptive chemistry meet, and each one, organic or inorganic, can be made to shed light upon the other. Finally, the relations between physical properties and chemical composition are most easily investigated upon the organic side, and here are problems enough to keep men busy for a good part of the present century. All the properties of a substance should be calculable from its composition ; but the adequate data and the conclusive theory are far beyond our reach. We have a few beginnings, nothing more.

In physical chemistry, it seems to me, we find the unifying principles which are to bind all the subdivisions of our science into one. Some of the problems mentioned under the heading of descriptive chemistry are almost wholly physical in their nature ; only they are statical, and leave dynamics untouched. They deal with equilibria established by transformations of energy—a statement which holds true whether we connect it with the atomic theory or base it upon the phase rule. The laws of chemical equilibrium are fundamental, beyond question ; but antecedent to their application there was an interplay of active forces whose statutes are more general still. What is the nature of chemical change, and what laws govern its transformations of energy ? These, to my mind, are the most general questions of dynamical chemistry. They are raised by every reaction, and they involve the consideration of all the physical forces. The problems of thermo-chemistry, of electro-chemistry, of optical chemistry, are mere special cases arising under the more universal general laws, and they will cease to exist when the latter have been discovered. So ideal a condition may never be reached, but we can approach it.

How, now let me ask, shall the work of the future be done ? Hitherto, individual initiative has been the chief agency in

effecting progress, and each man has handled his own problems in his own way. By individual geniuses the greatest discoveries are made, but they are tried and tested by the collective intelligence of many laborers, more humble, perhaps, but also more patient and thorough. The genius is fortunate, but science has use for plodders as well, who furnish the commonplace facts that are the raw material from which laws and generalizations are developed. The great thinker needs only opportunity and encouragement; the rank and file of investigators, it seems to me, require something more. We need not fear that personal effort will cease; and still we may fairly ask whether it is sufficient for the tasks which are now waiting to be done.

One result of individualism in scientific research is evident. Our knowledge increases irregularly, unsymmetrically—with one phase overdeveloped and another neglected. In every group of data there are gaps to be filled, side by side with needless duplications. One man finishes a research only to find himself anticipated by some more fortunate worker, and he feels that his labor has been thrown away. Competition is a good thing, but coöperation is better, for it ensures that economy of effort which is as important in intellectual affairs as it is in the factory or in commerce. Can we, without stifling enthusiasm, without harming the individual, encourage the organization of research, and so give to science a swifter growth and a more perfect symmetry? That vague but potent agency, "the spirit of the time," has taken "organization" for one of its watchwords, and we can not escape from its spell. Collectivism and individualism, however, are not necessarily antagonistic; they are two forces acting side by side, and each helping the other. A man best develops himself when he works in harmony with his fellows.

Chemical societies are an invention of the nineteenth century, and they stand for one step in the right direction. In their meetings, by conference and discussion, and in their publications, by making research effective, they have done much to encourage investigation, and to avert, in some measure, useless duplications of effort. Through committees, they sometimes direct the growth of science, not by the exercise of com-

pulsion, but by classifying work that has been done and showing where work is needed. An extension of this process might easily be devised, in such manner that a definite field of study should be divided among a number of scholars, each doing his own share and earning whatever independent credit he deserved. In astronomy we already have an example to follow, for observatories have divided a part of their work in exactly this manner, each institution mapping a zone of stars assigned to it by mutual agreement. Coöperative research upon a well-considered plan ought to be possible among chemists. Some overlapping, some duplication, can not be avoided, but the waste can at least be diminished.

There is one other step which needs to be taken, and one which I have repeatedly urged on other occasions. There should be laboratories organized, equipped, and manned for systematic chemical research upon those problems which are too large for individuals to handle. The exhaustive determination of constants, for example, must precede the development of laws, and few chemists laboring singly care to attempt work of so tedious a nature. Each one often feels the need of data which do not exist, wants that he is unable personally to supply, and such a laboratory as I have in mind could render invaluable service. Astronomy has its observatories, biology is provided with experimental stations, physics is represented by institutions like the Reichsanstalt, while chemistry is almost unaided. Chemistry, the creator of wealth, receives few endowments, and those which have fallen to its share have been in aid, not of research, but of teaching. Great things have been and will yet be achieved in the universities, but their laboratories can cover no more than a small portion of the field. A laboratory for research would not compete with them; it would, on the other hand, reinforce their efforts. When, a hundred years hence, the progress and development of chemistry during the twentieth century is summed up, investigations carried on under endowments will fill a conspicuous portion of the stage. I have faith in the future, I believe it will be better than the past, and to my mind the great advances in science which we celebrate are only a beginning.

V.

THE EFFECTS OF TROPICAL CLIMATES UPON  
THE TEETH OF AMERICANS.\*

BY J. HALL LEWIS, D. D. S.,

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When the battleship *Maine* was destroyed in the harbor at Havana, some years ago, no one had any idea that one indirect result would be to present to the United States the very difficult problem of governing immense areas of tropical land and caring for the well-being of its practically unknown people. And when the United States did take possession of these tropical countries, surely no one imagined that from this action additional trouble would be given the dental profession, and before its practitioners would be placed problems very difficult of solution. Yet such has been the case, for the soldiers, sailors, and civilians of the United States returning to their native country after service in the Philippines and other tropical lands are found in a large percentage of cases to be suffering with severe dental lesions contracted during that service.

John T. Marshall, M. D., last year wrote an able and interesting paper describing the results of tropical service upon the teeth of the soldiers of this country while in the Philippines, Cuba, and Porto Rico, showing that the dentists and surgeons of the army treated fully seventy per cent of the soldiers for oral diseases of various kinds. Dr. Marshall, who was and still is in charge of the dental surgeons of the U. S. Army, being for two years stationed at the hospital at San Francisco, had the best of opportunities for such observations upon the enlisted men of the army.

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\*Address delivered September 30, 1904, in University Hall at the opening exercises of the Medical and Dental Departments of the George Washington University.

From recent studies of the teeth of the officers and sailors of the United States Navy, it would seem that these during a tropical sojourn are essentially affected about as are the soldiers, modified, of course, by the facts that the naval officers and men are better housed, better fed, and have more time and opportunity to keep the teeth in proper condition than have the soldiers in the field.

The oral lesions showing by far the greatest increase were the various forms of pyorrhea alveolaris, and dental caries. Of the former (pyorrhea) that form clearly caused by an excessive deposition of salivary calculus was largely in the majority.

Dr. Marshall claims that this excessive and rapid formation of calculus is "indicative of a disturbance in the equilibrium of the metabolic process of tissue waste and repair;" in other words, that the constructive process is not keeping pace with the destructive action on the system caused by excessive labor, anxiety, and irregular and insufficient food.

The gouty form of this disease was seldom noticed, which is not surprising when we remember that a hot climate causes the waste products of the system to be freely eliminated by excessive perspiration and activity in other methods of excretion; that is, during a comparatively short stay in the tropics.

By far the greatest increase, however, was noticed in dental caries or decay of the teeth, and this was in very many instances not simply the usual progress of the disease, which is liable to take place anywhere and at any time of life, but a most excessive and rapid destruction of tooth substance, in some instances to such an extent as almost, if not quite, to destroy all of the teeth.

As an instance of the wonderful rapidity with which this "caries" may advance under favoring conditions may be mentioned the case of a naval officer, who just before leaving for the Philippines had his teeth all put in good order, to eliminate, as he thought, the possibility of any dental trouble during his absence. After a short cruise in Philippine waters he was taken with "dengue." Now, this tropical fever, though usually of short duration and not at all dangerous of itself, yet,

somewhat after the manner of our own grip, may leave the system much debilitated and ripe for other troubles. So with this officer. He was ordered home on sick leave and his mouth was examined just eleven months after the teeth had been pronounced in good order. The conditions presented were astonishing, for nothing was left of his dental organs other than roots and a few jagged splinters of teeth. The crowns had all wasted away from ordinary (or rather extraordinary) decay. The rough remnants had cut and excoriated the sides of the tongue, and the swollen gum structure had grown over and partly concealed the roots of what less than a year before were fairly good teeth.

While this may be an exceptionally severe case, yet it is undeniably true that the teeth and contiguous structures of foreign sojourners in tropical and sub-tropical climates are much more susceptible to caries and other oral diseases, and these diseases progress much more rapidly and disastrously than in countries having different climatic conditions.

While later study and observations of the remarkably destructive effects upon the teeth of naval officers from tropical service agree with and are corroborative of those of Dr. Marshall concerning the teeth of the army, yet they do not hold good to the same extent as regards the causes of such as suggested by Dr. Marshall.

The soldier in the field has but little time to attend to cleansing of the teeth; he is under constant strain and anxiety, often poorly fed, badly protected from unaccustomed climatic conditions, and suffering from physical and mental depression, all of which certainly assist the ravages of dental caries, but of themselves would not account for its rapid destructiveness.

The naval officer in service is in these respects much more fortunate than his army confrere, for while he may be under great mental strain and anxiety from the heavy responsibility of his position, yet his surroundings are in the main hygienic, and should he become ill the ship's surgeon is ever present to give immediate and skillful treatment. The naval officer does not, therefore, even in war times, suffer to any great extent from exposure, insufficient diet, neglect, or lack of sanitation.

Another and fairly conclusive proof that it is not the neglect of the teeth and body incident to active war duties that causes excessive caries is in the fact that the wives and families of the soldiers, as regards their teeth, are affected about as are the soldiers themselves; so that these are probably but contributory causes to the general dental breakdown.

Still another possible reason is in the enervating effects of the tropical climate and the many special diseases to which the foreigner is liable, thus weakening the individual system and rendering it less able to combat the dental caries when begun by other agencies. A marked instance of this may be seen in the progress of the disease known as "sprue," or tropical diarrhoea, which very often attacks and is extremely dangerous to the foreign dweller in such countries. One effect of this disease generally present, if left unchecked, is a destructive action upon the mucous and gum tissues of the mouth and contiguous parts, these structures being made soft, swollen and covered with aphthous and ulcerative patches, and the spaces made by the fissures in the soft parts, and the latter's loosening and pulling away from the teeth, become filled with decomposing matter; the mouth, in fact, is rendered unspeakably foul, the patient's attempts at cleansing being ever weak because of the resulting pain from excessive sensibility of the structures.

This disease (sprue) is liable to continue for a long time, and during its progress is marked by numerous severe recurrences of the original trouble. That it may be of microbic origin is more than possible, and from the ever-present foul condition of the oral tissues a suspicion surely should be engendered that the mouth is a high offender, if not the sole cause of the chronicity of the disease, because of probable reinfection of the system from its filthy bacterial hordes.

Whether this latter surmise be correct or not, after the initial attack of "sprue" the mouth should be cleansed by instrumentation and local medication and kept as thoroughly in that condition as possible, which will certainly prevent injury to the teeth, will probably assist an ultimate cure of the disease by enabling the patient to take food more acceptably, and possibly

entirely prevent recurrent infection or chronicity. In fact, the oral cavity, and the entire system as well, in a tropical land is affected by the total change in climatic conditions, change of habits, of environment, by that terribly depressing disease, "nostalgia," and also, and surely not to the least degree, by the change of food materials or by the alteration of systemic receptivity of the same kinds of food under entirely different surroundings.

For instance, in the Philippines the food of the native is essentially fish and fruits, the latter being especially abundant and of infinite variety, the most common being the mango, guava, cocoanut, pineapple, banana, and, in short, it would seem that almost every fruit that flourishes in any other part of the world has its analogue in this favored orchard spot of the earth, though it must be said that most of these fruits are not seductive to the American palate; and while many are especially rich in pepsin and tannin (thus healthful in such a climate), yet the only one that our countrymen particularly take to is the acid and adhesive mango, an ideal substance for producing initial decay of the teeth.

The native flesh foods are few and of poor quality. Even the chickens are tough, stringy, and not overpalatable. In fact, it would seem that nature intended that the inhabitant of these climates should subsist principally, if not entirely, upon a vegetable diet.

But with the advent of the Americans all these dietary conditions were changed. When they altered their place of abode they did not consider that they at all altered the condition of their stomachs; so they longed for their former food, and, as usual, when any number of Americans want anything very badly they always get it; so now most excellent beef, mutton, and other meats are imported, principally from Australia, and the American in the Philippines can readily procure practically the same food to which he is accustomed at home, preceding and finishing his dinner, if he desires, with the whisky of his native land.

Other than water, the native looks mostly to the cocoa palm for his fluid refreshment. The milk of the cocoanut is palat-

able and nutritious, and from the sap of the tree is distilled the "bino," more potent in its intoxicating effects than the absinthe of the French or the creosoted Scotch of our own Professor Wiley.

The United States Government, recognizing the fact that the soldier with his teeth in good condition is a better man in every respect than when suffering with any oral disease, has appointed a corps of dentists to give attention to the army while in service, and in this connection it may be interesting news to many here present that these dentists, thirty in number, were chosen by competitive examination from many hundreds of applicants, representing fifty-six dental colleges, and of these thirty successful ones three were graduates of our own Columbian University Dental Department.

While this small number of dental surgeons is totally inadequate to keep the teeth of the army in proper condition, yet they may succeed in so treating the enlisted men that when the latter's terms of service are completed they may be re-enlisted, the government army requirements being that, as regards the teeth, the applicant, to be accepted, must have at least two opposing molars on each side of the mouth, a requirement so remarkable that it surely must have emanated from some special "board of strategy."

The naval man in this respect is much worse off in foreign service than the army member, for, so far, Congress has omitted to authorize the appointment of dental surgeons for that branch of our fighters.

It is sincerely to be hoped that this action will soon be taken by our Government, and with the army corps enlarged and the membership of both branches perfected and working in harmony, a systematic examination of all the possible causes of dental deterioration in tropical climates may ultimately lead to evolving some method of preventing the extreme suffering and injury from the loss of such valuable organs as the teeth.

VI.

THE SITE OF ANCIENT PHALERUM.

BY MITCHELL CARROLL, PH. D.,  
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Among the many disputed points in the topography of Athens, none involves problems of more serious moment than the site of ancient Phalerum ; and its determination would lead to the solution of other important questions which now engage the attention of topographers. Phalerum was the old seaport town of Athens before the ascendancy of Themistocles and the rise of the Athenian Empire. Its history prior to the building of the Piraeus, with its magnificent harbors, was interesting and important ; but, eclipsed by the glory of Greater Piraeus, it soon became of second-rate importance, famous only for the Long Wall reaching from Athens into its territory, for its ancient shrines, its pottery, and its anchovies. We wish to review its history, to determine its site, and to call attention to the features of Athenian topography which become in consequence satisfactorily settled.

A brief description of the coast line of Attica that borders the Athenian plain is essential for the comprehension of the problems involved. Southwest of Athens at a distance of from three to four miles the coast line is formed by the broad and regular Bay of Phalerum, an open roadstead with shelving, sandy beach. The Phaleric bay is bounded on the east by the rocky headland of Trispyrgi ; on the west by the promontory of the Piraeus. Between these two points extends a regular stretch of coast line about two and one-half miles in length. To the east of the bay the coast line extends southward in irregular fashion, affording no shelter for ships at anchor. The shelving shore of the bay itself was well adapted for the beaching of small ships, but not for the harboring of vessels. But just to the west of the bay, where the Piraeic promontory

juts out into the sea, it encloses a small harbor, elliptical in shape, now called Fanari, large enough for the needs of a small navy.

Back of this harbor is the hill of Munychia, the highest point of the peninsula, to the southwest of which is an almost landlocked basin, oval in shape, now known as the harbor of Zea or Pashalimani. Beyond this the coast sweeps round in broken, irregular curves until it reaches the great harbor of the Piræus, a sheet of water about 800 by 1,400 yards in extent.

Somewhere along the Bay of Phalerum, not far distant from the shore, lay in ancient times the deme and town of Phalerum. Even in the Heroic Age it was already important as a seaport, for from here the hero Phalerus, who gave the town its name, sailed with Jason to Colchis in search of the Golden Fleece (Pausanias, I, 1-4). From here Menestheus went with his Athenian contingent to join the Greek fleet on its way to sacred Ilium (Paus., I, 1, 2). From here Theseus embarked with the fourteen Athenian youths and maidens, to be offered up to the savage Minotaur in satisfaction to King Minos of Crete for the death of his son Androgeus (Paus., I, 1, 2).

Herodotus is our chief authority for the importance of Phalerum in historical times. He tells how the sons of Pisistratus cut down the trees in the plain of Phalerum, making the district fit for horsemen to ride over, and then sent out their Thessalian cavalry to attack the camp of the Lacedæmonians, who had come at the bidding of the Delphic oracle to overthrow the tyrants; and how they slew many of the enemy, and shut up the rest in their ships (Her., v, 63). He tells how the Aeginetans once sailed to Athens with ships of war and devastated Phalerum and many other demes in the coast region (v, 81). In his account of the battle of Marathon he tells how the barbarians after the battle came and lay with their ships in the sea which is off Phalerum—for this was then the seaport of the Athenians—and then proceeded to sail back to Asia (vi, 116). He later describes how in the battle of Salamis the barbarians, whose ships had escaped destruction, fled and came to Phalerum to be under the protection of the land army (viii, 65-67; 91, 92), whence under cover of night they with-

drew their ships to the Hellespont (VIII, 107, 108). Meanwhile, on Cape Colias, to the east of the Bay, the wrecks of the fleet of the Medes were washed up by the waves (Her., VIII, 96; Paus., I, 1, 5).

Pausanias's account of Phalerum in his *Description of Attica* (I, 1, 4-5) emphasizes its interest as a spot once of moment, but no longer so. He mentions a number of sacred precincts and monuments, showing that it was a place abounding in hoary traditions. Here were sanctuaries of Zeus, of Demeter, of Sciradian Athena erected by an early historical character (I, 36, 4). Here were altars of heroes, probably Nausithous, the steersman, and Phæax, the lookout man of Theseus' ship, on his voyage to Crete, of the children of Theseus and of Phalerus, the eponymous founder; and here were altars of gods called Unknown, probably seen by the Apostle Paul during his sojourn in Athens, and suggesting the theme of his Areopagus address (Acts XVII: 23).

We have many references to the fact that, prior to the building of Piræus, Phalerum was the seaport town of Athens, in addition to the passage of Herodotus (VI, 116), already cited. Pausanias (I, 1, 2), Diodorus (XI, 41), and Cornelius Nepos (Themist., 1) all mention the fact in commemorating the statesmanship of Themistocles in building the Piræus, and their statements have reference, not to the bay, but to the harbor, of Phalerum. They speak of this harbor as being small and poor, not adequate to the needs of the growing metropolis. Hence it is clear that we must locate precisely the harbor of Phalerum, and this will serve as a stepping-stone in determining the site of the deme of the same name.

Three views are held as to the site of ancient Phalerum: (1) Most recent authorities, notably Frazer (Pausanias, II, p. 12), agree with Ulrichs (*Reisen und Forschungen in Griechenland*, II, p. 158 ff.) in placing it near the low rocky height, known as Trispyrgi, crowned by the chapel of St. George, at the southeast corner of the bay. So firmly settled is this view that the spot is now usually called Old Phalerum. (2) Milchhoefer, on the contrary (*Karten von Attika*, Text, I, p. 24 ff.; II, p. 1 ff.), would place Phalerum near the chapel of the

Savior, which stands on a conspicuous rocky elevation about one and a quarter miles north of St. George and about fourteen hundred yards from the sea. (3) Leake (*Topography of Athens*, p. 308), one of the earliest topographers, located it to the west of the Bay of Phalerum, on the eastern slope of Munychia, and extending eastward along the bay, practically the site of New Phalerum, now a popular resort of Athenians. This view has been recently revived by Gardner (*Ancient Athens*, pp. 551-553), and we wish by a restatement of the evidence and a new interpretation of the facts to show that this is the correct location.

It will simplify the situation, first, to show that Milchhoefer's hypothesis is untenable: (1) Phalerum, as has been shown, was the old port of Athens, and was therefore on the seacoast, not 1,400 yards away; (2) the Long Wall between Athens and Phalerum, according to Thucydides (II, 13, 7) was thirty-five stadia in length, or nearly four miles; hence a site only one and one-half miles from Athens is altogether out of the question. The decision therefore lies between the usually accepted hypothesis of Ulrichs, locating Phalerum to the east of the Bay, and the recently revived hypothesis of Leake, locating it to the west of the Bay of Phalerum.

1. If we can fix the site of the old harbor of Phalerum it will help in determining the site of the town itself. The two chief authorities on the harbors of Athens are Thucydides and Pausanias. Thucydides' (I, 93, 3) statement is as follows:

Ἐπεισε δὲ καὶ τοῦ Πειραιῶς τὰ λοιπὰ ὁ θεμιστοκλῆς οἰκοδομεῖν (ὑπῆρκετο δ' αὐτοῦ πρότερον ἐπὶ τῆς ἐκείνου ἀρχῆς ἥς κατ' ἐνιαυτὸν Ἀθηναίοις ἤρξε), νομίζων τό τε χωρίον καλὸν εἶναι, λιμένας ἔχον τρεῖς αὐτοφρεῖς κ. τ. λ. Pausanias (I, 1, 2) probably had this Thucydides passage in mind in the following: θεμιστοκλῆς δὲ ὡς ἤρξε, τοῖς τε γὰρ πλέουσιν ἐπιτηδειώτερος ὁ Πειραιεὺς ἐφαίνετό οἱ προκείσθαι καὶ λιμένας τρεῖς ἀνθ' ἑνὸς ἔχειν τοῦ Φαληροῦ, τοῦτό σφισιν ἐπίνειον εἶναι κατεσκευάσαστο.

The Pausanias passage is misinterpreted by both Leake and Gardner, who would confine it to three sections of the great harbor of Piræus, and the Thucydides passage by Leake by a similar construction. There is, however, no inconsistency of statement

between Thucydides and Pausanias. Both apply the word Piraeus to the entire peninsula; both refer to three distinct bodies of water, the three harbors earlier described; and the further statements of Pausanias show that there is no authority whatever for considering three divisions of the great harbor meant, when there is reference to three harbors. Thus in the next sentence Pausanias adds: καὶ νεῶς καὶ ἐς ἐμὲ ἦσαν οἴκοι καὶ πρὸς τῷ μεγίστῳ λιμένι τὰφος θεμιστοκλέους, manifestly a reference to the great harbor of Piraeus as a whole. And after some account of the Piraeus, he continues in I, 1, 4: ἔστι δὲ καὶ ἄλλος Ἀθηναίοις ὁ μὲν ἐπὶ Μουνυχίᾳ λιμὴν \* \* ὁ δὲ ἐπὶ Φαλήρῳ, that is, the second of the three is the harbor usually called Zea or Pashalimani south of the hill of Munychia, and the third what is commonly known as Munychia or Fanari, southeast of the hill, the original Pre-Persian harbor referred to above (ἀνθ' ἐνὸς ἔχειν τοῦ Φαληροῦ). A study of the other passages cited by Milchhoefer (*Schrift-Quellen zur Topographie von Athen*, p. cv) confirms this interpretation;<sup>1</sup> and the ruins of ship-sheds is a further evidence that these were the three fortified harbors of the Piraeus. (See Gardner, "*Ancient Athens*," pp. 562-563.)

If we accept the third and smallest of the three harbors of the Pirais peninsula as the old harbor of Phalerum, we have the first link in the chain of evidence for the determination of the site of ancient Phalerum itself. Pausanias expressly speaks of this harbor as being in the neighborhood of Phalerum (λιμὴν \* \* ὁ δὲ ἐπὶ Φαλήρῳ). Hence the deme and town would hardly be two-and-one-half miles away from the harbor at the eastern end of the Bay.

Other evidence adds to the strength of this position.

2. Thus Strabo (ix. p. 398) in naming the seacoast demes from Piraeus to Sunium, says: μετὰ δὲ τὸν Πειραιᾶ Φαληρεῖς δῆμος ἐν τῇ ἐφεξῆς παραλίᾳ · εἰθ' Ἀλιμουῖοι Αἰξωνεῖς Ἀλαεῖς κ. τ. λ., stating that the deme Phalerum immediately succeeded along the coast eastward the deme Piraeus and was in turn succeeded by the deme Halimus.

3. Next consider the evidence for the site of Halimus, the succeeding deme to Phalerum. Milchhoefer (*Karten von Attika*, Text, II. 2) argues with force that Halimus occupied the territory between St. George to the east of the Bay, and St. Cosmas, about three miles

<sup>1</sup> Schol. ar. Pax 145; Strabo ix, p. 395; Com. Nep. Themist. 6; Hesychius s. v. Zea; Timaeus Lex. Plat. p. 260.

further south. This stretch of land is now called Kalamaki, a name readily derived from Halimus. Demosthenes (c. Euboul., p. 1302, 10) states that Halimus was thirty-five furlongs from Athens, a distance that would throw it into this territory. Furthermore, Cape Colias was of this deme, for the Demeter-shrine mentioned as being in its neighborhood (Hesych. s. v. *Κωλίδας*. ἔστι δὲ καὶ Δημητρός ἱερὸν αὐτόθι πολύστολον) is, according to Plutarch (Solon 8), none other than the Thesmophoria sanctuary of Halimus (Paus. I, 31, 1.)

4. As to Cape Colias, there are two disputed sites assigned to it—the promontory of St. George, so often referred to in this paper, and the tongue of land further south known as Cape Cosmas. Ulrichs, Bursian, and Frazer adopt the latter site; Leake, Milchhoefer, and Gardner, the former. Pausanias (I, 1, 4) states that Cape Colias is twenty furlongs distant from the objects mentioned in Phalerum, and refers to its Aphrodite shrine. Those who locate Phalerum at St. George naturally locate Cape Colias at St. Cosmas in order to have the right distance between those points, but in so doing they overstep the mark by over five furlongs. Hence evidence for the St. George site as Cape Colias is evidence for the location of Phalerum to the west of the Bay, twenty furlongs away. Now St. George can with propriety be called a promontory (*ἄκρα*), while St. Cosmas is merely an offshoot of land hardly geographically deserving the name of cape. Then Pausanias mentions Cape Colias and the Aphrodite shrine along with Phalerum, while he reserves mention of the Thesmophoria shrine of Halimus for the special section on demes (I, 31, 1); this he would hardly have done had the Aphrodite shrine been as far south as St. Cosmas. Finally, Milchhoefer states that the current which sweeps round the Piræus peninsula could well carry the wrecks of the Persian ships, referred to above, to St. George, but not to St. Cosmas. The weight of evidence therefore favors St. George as the site of Colias.

The evidence generally cited for the location of Phalerum at St. George is as follows: Paus. I, 1, 2, *Φάληρον δέ, ταύτη γὰρ ἐλάχιστον ἀπέχει τῆς πόλεως ἢ θάλασσα*. Paus. VIII, 10, 4: *Ἀθηναίοις μὲν δὴ σταδίους εἰκοσὶν ἀφέστηκε τῆς πόλεως ἢ πρὸς Φαλήρων θάλασσα*. Schol. Ar. Birds, 1694, *φιάλην πεσοῦσαν ὀφθῆναι ἐν τῷ Φαληρικῷ ἀπέχοντι σταδίους εἰκοσι*. As the eastern end of the Bay near St. George is the nearest point of the coast to the city and answers fairly well in distance to the twenty furlongs mentioned, these statements are

taken as conclusive proof for the site of the town of Phalerum. But the last two passages quoted refer rather to the Bay than to the deme of Phalerum, and the first refers merely to the harbor nearest the city. The statement of distance is not exact enough to be convincing.

Then, furthermore, actual traces of the Long Wall to Phalerum, mentioned by Thucydides, found in the neighborhood of St. George, are cited as evidence by the advocates of this site (See Ulrichs, *Reisen* II. p. 162; Curtius, *Att. Stud.* I, p. 73; Kaupert, *Monatsber. d. k. Akad. d. Wiss. zu Berlin* p. 632 ff.). Milchhoefer (*Karten v. Att.* II. 2 ff.) later endeavored to trace the remains of the Wall detailed by Kaupert, but in vain. In fact throughout this investigation we have found all evidence drawn from remains of walls or houses too indefinite to possess any scientific value.

5. This brings us, however, to our final argument and to a consideration of the most important corollary to the determination of the site of ancient Phalerum—namely, the discussion of the so-called Third Long Wall of Athens.

Most topographers, with the notable exceptions of Leake and Gardner, have advocated the existence of a Third Long Wall, called the Phaleric, in addition to the two Long Walls to the Piræus. As the remains of this third Long Wall have never been satisfactorily traced, nor its utility satisfactorily explained, the reasons for belief in its existence have rested mainly on the literary evidence.

This is as follows:

a. Plato's expression τὸ διὰ μέσου τείχος (Gorgias, 455 E) has been taken as evidence of the existence of three Long Walls, one on either side of a middle wall in the system of fortifications. Leake, however, renders this "the wall between city and port," in which sense the term διαμέσου is used by Dio Chrysostom VI, 87, καίτοι διακρίσεων σταδίων εἶναι τὴν περίμετρον τῶν Ἀθηνῶν, τοῦ Πειραιῶς συντεθεμένου καὶ τῶν διαμέσου τειχῶν.

b. Harpocration s. v. διαμέσου τείχους: τριῶν ὄντων τειχῶν ἐν τῇ Ἀττικῇ ὥς καὶ Ἀριστοφάνης φησὶν ἐν Τριφάλῃ, τοῦ τε Βορείου καὶ τοῦ Νοτίου καὶ τοῦ Φαληρικοῦ κ. τ. λ. This passage of a late lexicographer is discounted by Leake, as the Aristophanes passage is not extant, and there is nothing to show that the comic poet had reference to the Long Walls.

c. This leaves as the only strong evidence for the existence of the Third Long Wall, Thucydides, II, 13, 7: τοῦ τε γὰρ Φαληρικοῦ

τείχους στάδιοι ἦσαν πέντε καὶ τριάκοντα πρὸς τὸν κύκλον τοῦ ἄστεως καὶ αὐτοῦ τοῦ κύκλου τὸ φυλασσόμενον τρεῖς καὶ τεσσαράκοντα. ἔστι δὲ αὐτοῦ δ καὶ ἀφύλακτον ἦν, τὸ μεταξὺ τοῦ τε μακροῦ καὶ τοῦ Φαληρικοῦ. τὰ δὲ μακρὰ τεῖχη πρὸς τὸν Πειραιᾶ τεσσαράκοντα σταδίων, ὧν τὸ ἕξωθεν ἐτηρεῖτο.

This passage at first reading clearly implies the existence of the Phaleric Wall in addition to the Long Walls to Piraeus, but before discussing it let us cite the rest of the evidence.

d. Thucydides himself elsewhere appears to have known only two Long Walls, namely, the Phaleric and the Piraeic. See I, 107, 1. *Ἦρξαντο δὲ κατὰ τοὺς χρόνους τούτους καὶ τὰ μακρὰ τεῖχη ἐς θάλασσαν Ἀθηναῖοι οἰκοδομεῖν, τό τε Φαληρόνδε καὶ τὸ ἐς Πειραιᾶ.*

e. Aeschines (II. 173, 174), Pseudo-Andocides (III. 4-7), and Livy (xxi. 26, 8), speak only of two Long Walls, the northern and the southern, and were apparently in ignorance of the existence of a third.

f. Xenophon (Hellenika II. 2, 15) thus states the demand of the Lacedaemonians, after the fall of Athens, for the destruction of the Long Walls: *προυκαλῶντο δὲ τῶν μακρῶν τειχῶν ἐπὶ δέκα σταδίους καθελεῖν ἐκατέρου.*

This passage of Xenophon shows there was certainly no Third Long Wall at the close of the Peloponnesian War. Pausanias (I, 2, 2) in referring to the ruins of the Walls in his day is silent as to the Third Wall, and he was doubtless familiar with the passages quoted from Thucydides. Those who locate ancient Phalerum at St. George necessarily hold to the existence of this Third Wall. They assert that the Athenians first built two Long Walls from Athens, one to Piraeus and one to Phalerum, which diverged until they were two-and-a-half miles apart, leaving the whole space of the coast of the Phaleric Bay unprotected and offering perfect freedom to an enemy's navy to attack the city; that, some years after, the Athenians, realizing their mistake, built a second wall to Piraeus parallel to the northern Long Wall, and permitted the Phaleric Wall to go to ruin.

One argument used for locating Phalerum at St. George was that it was only about twenty furlongs from the city. But Thucydides states that the Phaleric Wall was thirty-five furlongs in length. Kaupert would remove this discrepancy by carrying the Phaleric Wall 1140 yards southwest of St. George, thus making the wall thirty-six furlongs in length. But this is hardly plausible.

Now if, in the light of the evidence presented, we locate ancient Phalerum to the west of the bay, the southern and the Phaleric Wall become identical, the wisdom of the Athenians in the structure of their fortifications is justified, the statements of Thucydides as to the length of the walls become clear, and the utter lack of mention of a so-called Third Wall from the close of the Peloponnesian War is explained. This leaves only the implied statement of Thucydides that there were Long Walls to Piræus in addition to the Phaleric Wall to be accounted for. Leake thinks it was merely "a negligence of expression"; Gardner, that "the Piræic Wall which was the more important and the more liable to attack, was a double wall, with a face on either side" (*Ancient Athens*, p. 70). But however this passage may be interpreted it seems clear that the so-called Phaleric Wall from Athens to the east of the bay has existed only in the minds of modern topographers, notably Wachsmuth, Kaupert, Curtius and Frazer.

In conclusion, if the site of ancient Phalerum be accepted as being to the west of the bay at the eastern foot of the hill of Munychia, and extending thence along the coast, we have naturally as its corollaries the settlement of the disputed problems in regard to the harbors of Athens, the site of Cape Colias, the site of the deme Halimus, and the so-called Third Long Wall. Surely an hypothesis that brings so many data into harmonious relation is logically correct.

VII.

SOME EXPERIMENTS ON ELECTROLYTIC CON-  
DUCTION WITH REFERENCE TO THE  
ION THEORY.\*

BY NEVIL MONROE HOPKINS, B. S., M. S.,  
Assistant Professor of Chemistry.

The thesis of which the following is an extract is divided into three parts :

1. An historical outline of electrochemical science since the time when the galvanic or voltaic current was introduced into chemistry.

2. A research portion in which twelve separate experimental researches were made upon electrolytic conductivity. The methods employed are described in detail, and the various pieces of special apparatus used are illustrated by drawings.

3. A bibliography of electrochemistry in general from the earliest writings.

SUMMARY OF EXPERIMENTAL WORK.

1. Sulphuric acid is shown to be capable of electrolysis according to two separate schemes.

When dilute, hydrogen and oxygen only are obtained, but under suitable conditions, it may be so concentrated as to change its ionization and electrolysis. It is shown that sulphuric acid when electrolyzed in the concentrated condition, with proper conditions of current density, etc., breaks up into hydrogen, oxygen, ozone, and free sulphur accompanied by the formation of water. At a temperature above  $103^{\circ}.5$  C. the concentrated acid electrolyzes into hydrogen, oxygen, sulphur trioxide, and water.

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\*A thesis presented to the Faculty of the School of Graduate Studies of the Columbian University in part satisfaction of the requirements for the degree of Doctor of Philosophy. Washington, D. C., 1902.

Sulphuric acid is shown to dissociate, when diluted with a considerable volume of water, into the ions  $\overset{+}{\text{H}} \overset{+}{\text{H}}$  and  $\overset{-}{\text{SO}}_4$ , but when concentrated the dissociation results in the ions  $\overset{+}{\text{H}}$  and  $\overset{-}{\text{HSO}}_4$ .

Unless we concede the theory that water itself dissociates into the ions  $\overset{+}{\text{H}}$  and  $\overset{-}{\text{OH}}$ , the mechanism of the electrolysis of concentrated sulphuric acid and the actual facts observed can not be satisfactorily accounted for. The researches upon dilute and concentrated sulphuric acid go to support the theory that water itself is slightly dissociated into the ions  $\overset{+}{\text{H}}$  and  $\overset{-}{\text{OH}}$ .

2. Researches upon frozen electrolytes were made, in which it is shown that they conduct the electric current to a slight extent, depending upon the viscous-like behavior of ice. Physical experiments upon the viscous-like behavior of ice were made, supplemented by electrolytic studies. Various kinds of glass were studied electrically, and it was shown that every variety of glass when heated up conducts the electric current, but does not conduct when chilled down to low temperatures. This is in accordance with the theory that in electrolytic conduction we have moving ponderable particles of water as carriers of the electric current in electrolytes.

3. The ions in an electrolyte may be moved by static induction, and their presence as atoms after the charge is removed is proven through the agency of a reflecting galvanometer used as a chemical indicator. Unless electrolytic dissociation be true, it is difficult to account for the behavior of solutions when subjected to the influence of bodies carrying static charges of electricity upon their surfaces.

4. Electrolytic dissociation is shown simultaneously in two ways: First, by the action of a base upon an indicator as the base dissociates; and, secondly, by the increased electrical conductivity as the base ionizes. With the special apparatus used, the simultaneous observation of the two phenomena with the indicator and galvanometer is made possible.

5. Ions are shown to be attracted through a medium, as a magnet would attract bits of magnetic material. A plan is

outlined whereby the absolute velocities of ions may be determined upon the principle of mutual electrostatic attraction. They are shown to behave like pith balls when brought into the field of a static charge.

6. Ions are made to show that it is likely that they not only carry electrical energy, but also heat energy. A suggestion for determining absolute velocities is made, depending upon the heat convection of ions. By using a sensitive Beckmann thermometer, it is shown that the electric current traverses an electrolyte only by transport upon the ions, and that the ions are moving particles of matter.

7. An electric current passes through an electrolyte as quickly as it does through a conductor of the first class. It matters not what the composition of the electrolyte may be, whether the ions are light or heavy. Unless we have free ions about the electrodes ready to give up their charges, or, in other words, electrolytic dissociation, the responsiveness of electrolytes can not be readily accounted for.

8. Alternating currents at high frequency cause an electrolyte to heat up to a greater degree, or to the same degree in a shorter time, than alternating currents of low frequency of equal energy value. Heavy ions do not appear to respond as quickly as light ions to the alternating current, and the question of the inertia of the ions seems to be established—a possible application of the alternating current for the determination of atomic and molecular weights direct from a physical property, namely, inertia, is suggested. In the application of alternating currents to electrolytes it is shown that there appears to be an oscillation of the ions, the lighter ones traveling the greater distance, and the heavier ones through the lesser distance. There are a number of tables of data obtained bringing out the force of this statement. With more refined apparatus than that at the disposal of the experimenter, this piece of research promises valuable data.

9. An electrical current traversing an electrolyte is shown to have quantitatively the same effect upon a magnetic needle as a current of equal strength traversing a metallic conductor.

10. An electrical current flowing through an electrolyte within a glass solenoid produces the same number of lines of

force in a magnetic body as an equal current flowing through a metallic solenoid of equal dimensions and equal number of convolutions.

11. The capacity of an electrolyte for magnetically induced electrical currents is the same as a metallic conductor of equal ohmic resistance.

12. Ions may be set in motion by electromagnetic induction without electrodes. They may be made to oscillate and produce electromagnetic effects without giving up electrical charges. In other words, a closed coil of an electrolyte behaves like a closed coil of wire when subjected to the inductive effect of an alternating current.

The thesis throughout is strictly of an experimental character.

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#### UNIVERSITY APPOINTMENTS.

*Acting Dean of Columbian College, July, 1904:* WILLIAM ALLEN WILBUR, born in Mystic, Conn., August 15, 1864; graduated from Brown University, A. B., 1888; A. M. upon examination, 1894; elected to Phi Beta Kappa, a member of the Delta Kappa Epsilon Fraternity; a teacher at Vermont Academy, Saxton's River, Vt., 1888-'89; instructor in Latin, Colby Academy, New London, N. H., 1889-'90; Professor of History and English Literature, Howard Seminary, West Bridgewater, Mass., 1890-'95; Dean of Columbian Academy, 1895-'97; head Professor of English, Columbian University, 1897.

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*Instructor in Philosophy, October, 1904:* GEORGE S. PAINTER, A. B., Harvard University, 1892; graduate student (1892-'94) in Boston University; student (1894-'96) in the Universities of Berlin, Halle, Leipsic, and especially in the University of Jena, which conferred upon him in 1896 the degree of Ph. D.; has been since connected with the Departments of Philosophy of Tufts College, Boston University, and Bryn Mawr College.

## UNIVERSITY MISCELLANEA.

HENRY ST. GEORGE TUCKER, LL. D., Dean of the Departments of Law and of Jurisprudence and Diplomacy, was elected President of the American Bar Association at its recent session in St. Louis, to serve for the ensuing year. After an interval of twelve years, he succeeds in this high honor his father, the late John Randolph Tucker.

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W. F. R. PHILLIPS, M. D., Dean of the Department of Medicine and Professor of Hygiene, was elected President of the American Climatological Association at its annual meeting in June in Philadelphia.

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J. MACBRIDE STERRETT, A. M., D. D., Head Professor of Philosophy, will give an address on "Locke on Toleration" at the Johns Hopkins University celebration of the two hundredth anniversary of the death of John Locke, November 1, in McCoy Hall. Other speakers on this occasion are Principal C. Lloyd Morgan, of Bristol, England; Prof. F. J. E. Woodbridge, of Columbia University; Dr. William Osler, of Baltimore, and Dr. William T. Harris, U. S. Commissioner of Education.

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MITCHELL CARROLL, Ph. D., Head Professor of Classical Philology, at the last meeting of the Council of the Archaeological Institute of America, was reëlected a member of the Executive Committee of the Institute and was appointed a member of the Commission on Legislation for the preservation of American antiquities.

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HON. CARROLL D. WRIGHT, LL. D., United States Commissioner of Labor and Lecturer on Statistics and Social Economics in the Department of Jurisprudence and Diplomacy, on the first of January assumes his duties as President of Clark College, Worcester, Mass. Professor Wright is now giving his usual series of lectures on social economics.

HON. DAVID JAYNE HILL, LL. D., Professor of European Diplomacy, now on leave of absence as Minister of the United States to Switzerland, paid a visit to the University recently. He read a paper on Diplomacy at the St. Louis Congress, which we hope to publish in the University Bulletin.

ON the 14th of July last Dean Henry St. George Tucker delivered the annual address before the Indiana Bar Association in session at Fort Wayne, Ind. Civil Liberty was the subject of Dean Tucker's address, in which he made a masterly argument in favor of the theory that our civil liberties are based upon certain God-given and inalienable rights.

A RECENT contribution to the Law Library is the Manual of the Constitutions of New Hampshire, edited by James F. Colby, LL. D., a graduate of Columbian University Law School in 1875. Dr. Colby has been Professor of Law in Dartmouth College since 1885.

THE work now generally regarded as the standard authority on the important subject of trade-marks is "Paul on Trade Marks," Keese-Davidson Co., publishers, St. Paul, 1903. In the publication of this treatise Hon. Amasa C. Paul, who was graduated from the Columbian University Law School in 1882, has added to the reputation he had already acquired as one of the leaders of the Minneapolis bar.

AMONG the books prepared by professors in the University, which have recently appeared or are announced for publication in the near future, are the following:

1. Bismarck's Letters and Speeches, with introduction, commentary, and excursuses. By Hermann Schoenfeld, Ph. D., LL. D., Head Professor of German. D. Appleton & Co., New York.
2. A Treatise on the Jurisdiction and Procedure of the Supreme Court of the United States. By Hannis Taylor, LL. D., Professor of English Law, Lawyers' Coöperative Association, Rochester, New York.
3. Vance on Insurance. By William R. Vance, Ph. D., LL. B., Professor of Real Property, etc. West Publishing Company, St. Paul.
- Hughes on Federal Jurisdiction and Procedure. By Robert M. Hughes, Professor of Admiralty Law. West Publishing Company, St. Paul.

PROF. D. KERFOOT SHUTE'S "First Book in Organic Evolution," published a few years ago by the Open Court Publishing Company, has attained a recognized place as an important contribution to biological science, as is shown by the many favorable reviews of the work which have appeared in European as well as in American periodicals. We quote the following from the British Medical Journal (London): "The avowed object of Professor Shute's 'First Book in Organic Evolution' is to provide medical students with a general knowledge of evolutionary problems, presumably early in the course of their studies, and to this end an endeavor is made to present the subject in a manner intelligible to the general reader. We may say at once that for such a purpose it is the best book with which we are acquainted, though we may have criticisms to make on minor points. For special commendation may be singled out the account of the evolution of the brain, which can not fail to supply the student with ideas which will render his conceptions of the human brain, when he comes to study its anatomy and its development, far more intelligent."

The work has likewise met with praise in Italy, as indicated by the commendations of the *Revesta Filosofia Pedagogiae* (Bologna): "Utilissimo agli esordienti, questo volumetto contiene un sommario assai ben ideato ed effettuato di biologia evoluzionistica: vi si comincia coll' esporre la teoria cellulare, poi vi si parla dell' eredità, dell' ambiente variabile durante i periodi geologici, della trasformazione delle forme viventi, e della selezione naturale: infine vi sono capitoli dedicati alla evoluzione dell' Uomo. Un glossario biologico e molta illustrazioni incise e colorate accrescono la utilità del libro e lo rendono anche attraente pel lettore."

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THE conferring of the honorary degree of LL. D. upon Hon. Hannis Taylor, Professor of English Law, by the universities of Dublin and of Edinburgh, at their closing exercises in July, was an event of international importance in the world of letters. These honors were in recognition of the scholarly and scientific value of Professor Taylor's works, notably "The

Origin and Growth of the English Constitution." This work has been formally adopted as a text-book by the senate of the University of Dublin, and is in use at the universities of Oxford and of Edinburgh, as well as in many of the leading American universities and law schools. Volume I is now in its seventh edition, and volume II in its third edition. The position held by this book as an authority in legal science, as well as by Doctor Taylor's later treatise on "International Public Law," may best be shown by quoting briefly from the address of Sir William Turner, Vice-Chancellor of the University of Edinburgh, who presided over the graduation ceremonies:

"This mention of the relations of the two English-speaking countries leads me to begin my recital of the grounds upon which Dr. Hannis Taylor's title to recognition rests, by reminding you that he is the author of a monumental work, 'The Origin and Growth of the English Constitution.' Recognizing that American constitutional history finds its key in English constitutional history, of which it is the organic outcome, Dr. Hannis Taylor has given us an account of political development in England from the earliest beginnings which for comprehensiveness of range is without a rival. Dr. Hannis Taylor would be the last to claim to have written the final word on the English Constitution, yet with such thoroughness has he studied the results of the latest researches, such judgment has he brought to their interpretation, that it may be predicted without flattery that his book will enjoy permanent recognition as an authoritative exposition. Not less remarkable, however, than these first fruits of his literary activity is a treatise of later date on International Public Law. No country can boast a lengthier or more eminent series of writers on this great department of jurisprudence than America; but I do not hesitate to say that Dr. Hannis Taylor's volume, replete with historical learning, characterized by philosophical breadth of view, and distinguished for the classical stateliness of its diction, entitles its author to a conspicuous place in a galaxy which includes the names of Wheaton and Kent and Halleck, of Woolsey and Dudley Field."

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THE International Congress of Arts and Science held at St. Louis September 19-25, 1904, was based on the belief that the subdivision and multiplication of specialities in science had reached a stage at which investigators and scholars could de-

rive both inspiration and profit from a general survey of the various fields of learning, planned with a view of bringing the scattered sciences into closer mutual relations. The central purpose was the unification of knowledge, and it seemed appropriate that an effort toward this end should be made on an occasion such as that where the nations brought together an exhibit of their arts and industries. An assemblage was therefore convened at which leading representatives of theoretical and applied science set forth those general and fundamental conceptions which connect groups of sciences, reviewed the historical development of special sciences, pointed out their mutual relations, and discussed their present problems.

The Congress was organized by subjects, these being divided into: Division of normative science, with the departments of philosophy and mathematics; division of historical science, with the departments of history, politics and economics, law, language, literature, arts, and religion; division of physical science, with the departments of physics, chemistry, astronomy, sciences of the earth, biology, and anthropology; division of mental science, with departments of psychology and sociology; division of utilitarian sciences, with departments of medicine, technology, and economics; division of social regulation, with departments of politics, jurisprudence, and social science, and division of social culture, with departments of education and religion. Each of these departments was then divided into from two to twelve sections, making in all one hundred and twenty-eight sections. The directors of the Exposition appropriated \$150,000 for the expenses of the Congress, and eminent specialists from throughout the world were invited to address the Congress. One speaker was assigned to each division to treat of the unification of the sciences; two speakers were assigned to each department, one to treat of the fundamental conceptions and methods, the other of the progress during the last century, and two speakers were assigned to each section, one to treat of the relations to other sciences and the second to treat of the present problems. In addition, a limited number of ten-minute addresses were arranged for in the sections.

There were registered at the Congress 87 foreign speakers, 306 officers and principal American speakers, 138 ten-minute speakers, and 1,851 in attendance, or 2,382 in all. The addresses and papers are to be printed, those of each department constituting one volume in the series.

At this Congress The George Washington University was represented by President Charles W. Needham, as speaker for the Department of Jurisprudence; Hon. W. T. Harris, Lecturer on Philosophy, as speaker for the Division of Social Culture; Dr. F. W. Clarke, Professor of Mineral Chemistry, as speaker for the Department of Chemistry; Dr. Charles E. Munroe, Head Professor of Chemistry, speaker for the Section of Technical Chemistry; Hon. John W. Foster, Professor of Diplomacy, and Hon. David Jayne Hill, Professor of European Diplomacy, speakers for the Section of Diplomacy; Justice David J. Brewer, Professor of International Public Law, Chairman of the Department of History of Law; Dr. Henry St. George Tucker, Dean of the Departments of Law and of Comparative Jurisprudence and Diplomacy, Chairman of the Section on Constitutional Law, and Dr. H. W. Wiley, Professor of Agricultural Chemistry, Chairman of the Section of Technical Chemistry.

In addition, Prof. Simon Newcomb, U. S. N., formerly Professor of Astronomy in this University, was President of the Congress; Prof. Robert S. Woodward, of Columbia University, formerly Professor of Civil Engineering in this University, was speaker for the Division of Physical Science, and Prof. Theobald Smith, of Harvard University, formerly Professor of Bacteriology and Hygiene in this University, was speaker for the Section in Bacteriology.



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## CONTENTS.

I. The Sensational Idealism of Locke, Berkeley, and Hume. By James Macbride Sterrett.....	1
II. Bismarck as a Classic. By Hermann Schoenfeld. ....	27
III. American Contributions to the Science of Politics. By Hannis Taylor .....	38
IV. The Contemporary Development of Diplomacy. By David Jayne Hill.....	45
V. Science and Economics. By Carroll D. Wright.....	63
VI. Religion and Personality. By Edward B. Pollard.....	82
VII. The Constitution of Certain Halogen Oxyacids as Inferred from Thermo-chemical Data. Edwin A. Hill.....	94
VIII. Influence of Varying Strength Solutions of Formaldehyde on Enzymes of Animal Origin. By T. M. Price.....	104
Scientific Notes .....	109
University Appointments.....	111
University Miscellanea.....	112

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I.

THE SENSATIONAL IDEALISM OF LOCKE,  
BERKELEY, AND HUME.\*

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There are two opposing *dicta* as to historical systems of philosophy: 1. Each succeeding system refutes the preceding ones, so that there is no result. 2. No system of philosophy has ever been refuted. We hold with the latter—that philosophy is an organism of thought, in which the various historical systems are vital members. The only way any one destroys another is by fulfilling it, by at most reducing it from its position of the whole to that of a member of the whole. Thus modern philosophy is vitally connected with ancient philosophy, and thus the whole of modern philosophy, from Descartes to Hegel, is a complemental evolution of earlier systems. We can separate modern from ancient philosophy by the emphasis which it throughout has placed upon the problem of knowing, while ancient philosophy dwelt rather upon the problem of being, of ultimate reality. But modern philosophy is epistemological only as a necessary step to ontology. We get at being, at reality, only through knowing. The validity of what we know depends upon the character of our knowing processes. Modern philosophy is as prevalingly subjective as ancient philosophy was objective. It opened in Descartes with a subjective note. In his appeal to self-consciousness, Descartes started this subjective trend which philosophy has, as yet, scarcely transcended. Descartes himself used this appeal to

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\* Paper read before the Society for Philosophical Inquiry, Nov. 29, 1904.

self-consciousness to pass to objectivity, to reality, but to a double form of it—to two substances, to mind and matter—disparate and irreducible in every way—between them a great gulf, bridged only miraculously by a *tertium quid*—by the Deity. To resolve this dualism of Descartes became the problem of all succeeding philosophy; for philosophy is essentially an effort of the mind to reach a monistic principle of reality. This problem was worked through by Geulincx, Malebranche, and Spinoza to an apparent monism—to that of the one substance, with thought and extension as two attributes. But still the dualism would not down, for the two attributes were not deducible from the one substance, were not immanent and necessary distinctions within it, nor were they seen to have any relation to each other than that of a side-by-side parallelism. The problem of reconciling and unifying this dualism still remained. This was attempted first on the material side to explain mind from matter, and again on the ideal side to explain matter from mind.

We have taken as a distinct, connected group the systems of Locke, Berkeley, and Hume and termed it Sensational Idealism. We aim to show that Locke, in spite of ontological elements, and Berkeley, in spite of his spiritual elements, belong to the same school of psychological sensationalism as Hume. That is, Hume is the logical successor and completer of Locke's theory of the origin of our ideas, and Berkeley's immaterialism was only a step in the direction of Hume. Limits of space preclude giving anything like even an outline of the whole scope of the philosophy of these three thinkers. I leave out of view, indeed, the whole of Locke's and Berkeley's ontology, except so far as to show its inconsistency with their psychological basis.

Their ontology is good enough and true enough, but it is not deduced, nor deducible from Sensational Idealism, as Hume clearly sees and says. The thesis, then, is the rather narrow one of the theory of knowledge, or rather of nescience that can be reared on the basis of empirical psychology. We might characterize these systems as theories of Empirical Idealism, or Phenomenal Idealism, or Representative Perception, as well as Sensational Idealism. They all have to do with ideas, though

in a sense that Plato could not understand. In fact idea is the distinctive term with all three thinkers, and has led their systems to be termed "the ideal theory." First, on the sensational side, it is the theory of ideas that come through sensation.

#### I. LOCKE.

Locke's "Essay on the Human Understanding" (1690) inquires first into the original of those ideas. Probably the best modern equivalent for "idea" as they used the term is that of a fact or state of consciousness, or a psychosis. Almost necessarily Locke uses the term in a very wide and elastic sense. It stands, with him, alike for a nervous irritation of the senses and for the intellectual interpretation thereof—*e. g.*, for the feeling of touch, and for the conception of solidity. "It is evident" he says, "the mind knows not things immediately, but only by the intervention of ideas it has of them." We are not specially concerned with his disproof of innate ideas, as he conceives that doctrine, further than to notice that it practically negates the mental side of the relation, leaving the mind, to use his own favorite metaphors, "a sheet of white paper," "a yet empty cabinet," into which "the senses at first let in particular ideas and furnish it." Locke begins with the assumption of the ordinary dualism of mind and matter as two distinct substances—though he insists that the mind be regarded as a *tabula rasa*—till the senses impress it and produce ideas in it as an empty cabinet. We shall note later on all the justification he can find for the assumption of either of these two substances and its incompatibility with his psychological data and first principles.

Locke's problem was that of "the origin of ideas as the elements or materials of knowledge." Whence, he would ask, comes my present knowledge, how has it entered into me, and how has it been built up? His method is that of observation of his present mind in order to find how it has been built up from that primitive state in which it was only a *tabula rasa* or an empty cabinet. Ignoring the question as to how the *tabula rasa* can ever begin to be conscious of itself, he thus sums up his theory of the "original of our ideas":

*First.* There are no innate ideas. *Second.* "Since there appear not to be any ideas in the mind before the senses have conveyed any in, I conceive that ideas in the understanding are coeval with sensation, which is such an impression made in some part of the body as produces perception in the understanding. This great source of most of the ideas we have depending wholly upon our senses and derived by them from the understanding I call sensation. In time the mind comes to reflect on its own operations about the ideas got by sensation, and thereby stores itself with a new set of ideas, which I call ideas of reflection" (*Bk. II, c. I*). As to both sources he says, "The understanding is merely passive." It is necessary to remember that Locke uses the three terms interchangeably—idea, sensation, and perception—making them coeval and identical. The senses let into the mind directly, or we perceive directly, ideas—*i. e.*, we perceive ideas directly through the senses. It is scarcely necessary to characterize this as a very naïve sort of psychology of perception, which is now recognized to be a very complex process, a perception being a mass of sensations with an ideal element added. It is necessary also to note that what he calls ideas of reflection arise out of our ideas of sensation, as these latter arise out of impressions or tactual sensations; so that after all he does not admit reflection as an equal and independent source of ideas with sensation, for he holds that the originally empty chamber was to be first of all furnished by sensation, so that the source of any new set of ideas arising in it must still be sought in those sense impressions which, to use his other metaphor, "the white paper, void of all characters, without any ideas," first received. "Bodies," he says, "produce ideas in us manifestly by impulse, the only way in which we can conceive bodies to operate;" and yet he declines to meddle with the physical consideration of the mind or whether our ideas depend on matter or not, as Hume also did. Still he remained "the intellectual slave of his own *tabula rasa*," as later followers have done. This may suffice for the sensational element in his psychology.

*Second.* Let us now pass to his idealism, or to his theory of representative perception, from the how of knowledge to the

kind of knowledge. In *Book IV* he states the representative theory very plainly. "The mind hath no other immediate object but its own ideas, and knowledge seems to me to be nothing but the perception of the connection and agreement or disagreement or repugnancy of any of our ideas. It is evident that the mind knows not things immediately, but only by the intervention of the ideas it has of them." In treating of simple ideas he had already made the distinction between primary and secondary qualities of bodies. The power of bodies to produce ideas in us he calls qualities. While denying that most of our ideas of sensation are exact copies of the qualities of bodies, he still finds some to be so utterly inseparable from the bodies that they copy themselves in the mind. These qualities "are really in the bodies, whether we perceive them or no." These he calls primary qualities of bodies, which produce exact copies of themselves in the mind—namely, those of "solidity, extension, figure, motion or rest, and number." Secondary qualities, on the other hand, "are in truth nothing in the objects themselves, but powers to produce various sensations in us." That is, our ideas of colors, sounds, tastes, etc., are not copies of things. We do not know the real things through these secondary qualities of bodies. Again he says: "The ideas of primary qualities are resemblances of them and their patterns do really exist in the bodies themselves; but the ideas produced in us by the secondary qualities have no resemblance of them at all" (*Bk. II, c. VIII*).

This dualism in his theory of perception is the one which Berkeley so effectually disposed of, and which Hume carried out to the extreme of atomistic subjective idealism. While still maintaining this distinction, he also still maintains that all our simple ideas, whether coming from primary or secondary qualities—our perceptions—are real, all agree to the reality of things, not that they are all of them (but only those produced by the primary qualities of bodies) the images or representations of what does exist, but being in us the effects of powers in things without us ordained by our Maker to produce in us such sensations, they are real ideas in us" (*Bk. II, c. XXX*). Here he again denies our knowledge to be other than subject-

ive. We do not know things, but only our ideas of things, or, as he elsewhere says, "the mind has no other objects of knowledge than its own ideas, and knowledge has to do only with the agreement or disagreement of our ideas" (*Bk. IV, c. I*).

Again, in reply to the old question, "What is truth?" he says, "Truth seems to me, in the proper import of the word, to signify nothing but the joining or separating of signs (of things) as the things signified by them do agree or disagree with one another." All our simple ideas, he maintains, are real; our complex ideas (our conceptions or general ideas) not real—that is, he is an avowed nominalist, as also Berkeley and Hume were. Our knowledge of reality grows thinner as our conceptions—complex ideas—lead us beyond perceptions or simple ideas. These latter "do not belong to real existence, but are the creatures and inventions of the understanding, made by it for its own use, and concern only signs, whether words or ideas." These he distinguishes as modes, substances, and relations—*i. e.*, our ideas of time, space, substance, and causality. We shall return to the relations of substance and causality later on. We note his position here only as generally consistent with both his empiricism and his idealism, or theory of representative or subjective knowledge. We know not things in themselves as they are, but we know only our ideas, which are produced in us (though how we can know this is a mystery) only by some occult bodies through impulse. The outcome of it all is that we know nothing of substance, cause, or essence. We know things only phenomenally or through ideas. Knowledge consisting thus of ideas, what can we have of reality? He answers, "Our knowledge is real only so far as there is a conformity between our ideas and the reality of things." "But what," he adds, "shall here be our criterion? How shall the mind, when it perceives only its own ideas, know that they agree with the things themselves?"

This last sentence from Locke states the fundamental principle of subjective idealism which so readily was turned into absolute subjective skepticism by Hume. But Locke declines to make either of these two solutions. Common sense, rather than logical consistency, saves him from such necessary conse-

quences. He goes on in the same passage to solve the question of the reality of our knowledge thus: Admitting the difficulty of knowing how and how far our ideas agree with the reality of things, he says: "Yet there be two sorts of ideas that we may be assured agree with things. The first are simple ideas, and being necessarily the product of things operating on the mind in the natural way, and producing therein those perceptions which by the wisdom and will of our Maker they are ordained and adapted to. They carry with them that which is intended or which our state requires; for they represent to us things under those appearances which they are fitted to produce in us. And this conformity between our simple ideas and the existence of things is sufficient for real knowledge," sufficient, as he elsewhere says, for all practical purposes.

Thus he says "our faculties are not suited to the full extent of being, nor to a perfect, clear, comprehensive knowledge of things free from all doubt and scruple, but to the preservation of us, in whom they are, and accommodated to the use of life." This is common sense, but not science. He plainly avows the subjectivity of all of our knowledge, and he plainly also gives up scientific knowledge of reality. Thus again in response to the possible objection that our knowledge is but a dream of realities, he says: "Yet the certainty of things existing in *rerum natura*, when we have the testimony of our senses for it, is not only as great as our frame can attain unto, but as our condition needs." That is, he flees from his logical skepticism to unreasoned common sense for salvation from mere subjectivity.

But he finds, secondly, that one of our complex ideas also agrees with realities. Though he has disposed of substances as being merely feigned or convenient suppositions of a "*substratum* wherein they (our simple ideas) do subsist, and from which they do result," he yet goes on to say "secondly, all our complex ideas except those of substances (plural) being archetypes of the mind's own making, not intended to be copies of anything nor referred to the existence of anything, as to their originals, can not want any conformity necessary to real knowledge"—*i. e.*, agreement of our complex

ideas gives us all the reality we can have, except the idea of substances (spirit and matter), where we really know them as existing realities. In previously disposing of substance, he says it is an idea which we neither have nor can have by sensation or reflection, which are the "only passages that we can find of knowledge to the understanding." And yet we are bound to believe, he says—that is, common sense assures us—that the idea of substance is an ectype or copy of reality.

Before leaving Locke for the more logical development of his theory of empirical psychology in Berkeley and Hume, we must note that he gives us *Elements of Knowledge* far beyond what we can get from the system he lays down in the earlier part of the essay. As Reid observed, "A great part of that book is an evident refutation of the principles laid down in the beginning." His psychology gives us only ideas as objects of knowledge. Yet in *Book IV* he says that we have knowledge of two kinds that plainly can not come to us through sensation. He says:

"As to our knowledge of the real, actual existence of things, we have an intuitive knowledge of our own existence, a demonstrative knowledge of the existence of God, and of the existence of anything else, we have no other but a sensitive knowledge, which extends not beyond the objects present to our senses"—*i. e.*, beyond the ideas let into the blank mind through the senses.

Two things are here to be noted: (1) Neither self nor God are ideas of sensation or reflection (the only avenues of knowledge to the mind), and yet we know them. Hence the inconsistency with his fundamental psychological principle. (2) He here makes our knowledge of other things (than self and God) perceived through the senses (sensitive knowledge) to be of an inferior sort. Thus, later on, he adds:

"The notice we have by our senses of the existing things without us, though it be not altogether so certain as our intuitive knowledge or the deductions of reason employed about the clear abstract ideas of our own minds, yet it is an assurance that deserves the name of knowledge."

"Natural philosophy," he says, "is not capable of being

made a science." He thus falls back on the realism of common sense, or what he terms "the confidence that our faculties do not deceive us, as being the greatest assurance we are capable of concerning the existence of material things," thus really abandoning any theory of knowledge on his own psychological basis and reverting rather to the philosophy of Descartes for his ontology. Locke's own psychological theory gives him only the unrelated atoms of sense—the unrelated particular ideas through sensation as the material of all our knowledge. I say unrelated, for he denies that the senses can perceive or give us any idea of relations, but that these are really made up (Hume says feigned) only of simple ideas, as he tries to show in regard to the relation of cause and effect.

But Locke declined to be consistent. His ontology is far beyond the possibilities of his psychology. To be valid, it should have been deduced from it. The truth is that Locke was so deeply rooted in the common sense of natural, unreasoned realism and so held captive by theological ideas that these two latter elements saved him from utter skepticism at the expense of logical consistency. He made a notable and professed attempt to break away from Cartesianism, but had not the heart to carry it through.

## II. BERKELEY.

The same interests—those of practical life, and especially of religion—also mar the scientific work of Berkeley, to whom contemporaries ascribed "every virtue under heaven." His work was really a theological polemic against materialism. He set himself to purge Locke of the elements of empiricism and materialism, and did so in two ways. First, in rigorously carrying out Locke's theory of ideas and denying his distinction between primary and secondary qualities of body, and, second, by carrying to its fullest extent Locke's inconsistent nominalism in regard to substance. In both of these efforts he was scientific, simply showing what and how much could be deduced from Locke's psychological principles.

Locke really held (1) the theory of representative perception—that ideas are our only object of knowledge. (2) At the

same time he held to the conception of substantial matter as the unperceived background of all experience (and also to the Cartesian idea of spiritual substance), giving rise to our ideas of external things through its impression on the mind. Berkeley held rigorously to (1) the theory of ideas, and (2) on it denied any reality to matter or substance. This was his scientific work, the step he took toward carrying out Locke's theory to atomistic sensations, in distinction from his theological and Cartesian and Platonic ontology. We direct our attention, therefore, to these two points.

1st. He rigorously identified objects of knowledge with ideas, and with ideas exclusively. His "theory of vision" was partly the tool he used in reducing Locke's primary qualities of bodies to secondary, and consequently all of our knowledge to that of ideas alone, instead of leaving some to be real copies of qualities of external bodies, as Locke had done. What need, what sense, in supposing that that which is seen, heard, or tasted—*i. e.*, our ideas—is at the same time something unseen, unheard, untasted? What passage from the one to the other, from the phenomenal to the non-phenomenal, from ideas to things, when ideas is the sum total of all our knowledge? What sense in supposing our ideas of extension, solidity, and figures to be exact copies of real qualities of bodies any more than those of sight and taste? To such a question Locke's psychology could afford no scientific answer; none other, at least, but a retreat from his theory to common-sense realism.

"When Berkeley says there is no matter,  
It is no matter what he says."

But it is a scientific matter what he says on Locke's psychological theory of ideas. On that theory there was no need of, and there could consistently be, no known material world. On that theory the sum of material reality was merely the sum of things perceived by us—*i. e.*, ideas. The *esse* of all things was *percipi*—*i. e.*, to be = to be perceived. There was no other *esse* possible on that theory, no exterior material cause, "something really existing without us which doth affect our senses," as Locke said. Ideas exist only in the mind. You can never

get outside of mind in knowing. "Nothing exists except me." Knock out the "me," and we should have nothing left. There is no such distinction in knowledge possible as that between the external world as it is for us in our consciousness, and the external world as it is for or by itself, apart from perception of it. Its whole *esse* is *percipi*. Thus Berkeley developed logically the ideal side of Locke's psychology, as Condillac developed its merely sensational side by the reduction of mind to matter, of man to a machine. His "*Treatise on the Principles of Human Knowledge*" (1710) endeavored to show that what was true of the phenomena of sight was also true of the whole phenomenal world of sense. The only sense in it was ideal, subjective, phenomenal. Anything beyond this is an unwarranted inference. Berkeley denied the validity of the inference of external matter or substance, but affirmed the necessity of the influence of spiritual substance, or God. With Locke it was primarily and logically throughout external substance, or matter that imprints ideas on the mind, though later he subordinated this to being the mere medium of the Divine Will. Berkeley simply eliminates this medium and held that God, not matter, is the immediate "Imprinter" of ideas on the senses, as he later on holds that God is the immediate synthesizer of these ideas of sense.

In passing I may refer to Mr. George H. Lewes, the ontological skeptic, who, while denying that we can know either matter or God as the cause of our ideas, says that "the former assumption (that of matter), as more consonant with universal belief, must be accepted." Consistently, he should leave this an open question. But apart from this latter inference of spiritual substance, Berkeley's primary ground is that all the objects, or things of our knowledge, are ideas and nothing but ideas, thus keeping close to the facts of consciousness. "None of our ideas" he says, "exist without the mind." All our various sensations and ideas can not exist otherwise than in a mind perceiving them.

"The table I write on, I say, exists, and if I were out of my study I should say that it existed, meaning that if I were in my study I might perceive it, or that some other spirit does

actually perceive it. As to what is said about the existence of unthinking things, without any relation to their being perceived, that, to me, is perfectly unintelligible. Their *esse* is *percipi*; nor is it possible that they should have any existence out of the minds, or thinking things which perceive them." Locke and the other philosophers had felt compelled to infer a material substance in which sensible qualities inhere. Berkeley said that the synthesis was purely a mental one, and hence no need, no sense in inferring any other substance than mind. It is to be noted that Berkeley claimed, too, on the ground of common sense, to agree with the vulgar in believing in matter. "If by matter you understand that which is seen, felt, tasted, and touched, then I say matter exists. But if by matter you understand that occult *substratum* which is not seen, not felt, not touched—that of which the senses do not and can not inform you—then, I say, I do not believe in matter. I am not for changing things into ideas, but rather ideas into things."

He goes on, in his dialogue of *Hylas with Philonous*, to say that the materialists do not allow reality to the immediate objects of perception (*i. e.*, ideas), while he affirms them to be the only real things. "In short," he says, "you do not trust your senses; I do." He sided with the vulgar in recognizing no distinction between the reality and the appearance of objects; for in the current philosophical use of the term, matter stood for that which is not seen, not tasted, only a supposed *substratum*. Berkeley says: "That the things which I see with my eyes and touch with my hands exist, really exist, I make not the least question. The only thing I deny is that which philosophers call matter, or corporeal substance."

"That what I see, hear, and feel, doth exist, *i. e.*, is perceived by me, I no more doubt than I do of my own being; but I do not see how the testimony of sense can be alleged as a proof of anything which is not perceived by sense." Dr. Johnson's refutation of Berkeley by kicking a stone was senseless, for Berkeley never denied that what we call stones (our perceptions and ideas) existed. The table he perceived existed, but he denied that there was any unperceived, phantom table, lying underneath the apparent, the perceived table, the

only one given by the senses. He denied the existence of an invisible, untouchable *substratum*. The known *esse* of the table or cherry-stone is its *percipi*. Ideas are our only objects. For what are objects but things we perceive by the senses? And what do we perceive besides our own ideas and sensations? How, then, can any of them exist unperceived? Nothing exists but what is perceived. But if the objector say that though ideas do not exist out of the mind, there may be things like them, whereof they are copies of resemblances, Berkeley says: "I answer, an idea can be like nothing but an idea; a color or a figure (an idea in the mind) can be like nothing but another color or figure"—another idea in the mind. Mr. George Henry Lewes says that this, Berkeley's fundamental position, no metaphysician ever did or could object to.

I shall have to leave aside Berkeley's own ontology—the hyper-phenomenal, spiritual substances (souls), and the Spiritual Substance (God), simply repeating his psychological principles, that objects of knowledge are ideas and nothing but ideas, and that the *esse* of objects is *percipi*.

Before passing to Hume, we note only that Berkeley did not (as Kant did) make his *percipi*—i. e., to be perceived—equivalent to *intelligi*—i. e., to be known. That is, he slighted those relations, those transcendental categories which make our perceptions intelligible—synthesizes them into unity and order. The rather he looked upon all these—space, time, causality—as quite arbitrary. On the whole he was more nominalistic than Locke, only falling back upon a *deus ex machina* to do the synthesizing for us in any sort of an arbitrary way. As he had previously asserted that God is the imprinter of ideas on the mind, so here he expressly affirms that this synthesis of ideas is "God's synthesis." It is in fact just the lack of recognition of the reality of relations in experience, making sense-phenomena or ideas to be intelligible, that gives room for Hume's further development of sensational idealism to that of relationless atoms of sensation as the total of our knowledge. Had he seen what Kant analyzed out of experience; had he wrought out a doctrine of epistemology, instead of going *per saltum* from psychology to ontology, he would have made Hume impossible.

Berkeley writes as if ideas *per se* give the foundation of his system. But as a matter of fact he uses God's synthesis in place of those transcendental elements of experience which make his ideal world a *cosmos*. He held that the regularity that characterizes those combinations of ideas that are common to us all comes from God, "who associates ideas in spirits with absolute impartiality, and therefore in all alike and with absolute immutability." This regularity which results from God's unchangeableness and impartiality are what we call laws of nature. These laws are merely the principles upon which God combines ideas in all human beings, just as in the first place every idea is a word which God speaks to us. In all this, however, we have no epistemology, no principles of knowledge deduced from his empirical psychology. Thus Kant had ground to declare, as he did, that Berkeley's idealism is pure empiricism.

It is, however, ideas as intelligible, knowable—as related or synthesized, as significant of a permanent order that we find in his later ontology—But then these relations, intelligent making relations, are the arbitrary syntheses of God, not seen to be essential and constitutive elements of ideas in our knowledge of them—*i. e.*, not deduced from his psychology—not shown to be essential relations of sense-ideas. Hence the foundation of his system was that of sensational idealism, instead of that of critical or transcendental idealism, as with Kant, who made the *esse* of our known world to be *intelligi*, to be known—*i. e.*, related and unified perceptions. But the unknowableness of sensations or ideas, except as somehow related to each other, had not occurred to Berkeley. It needed a Hume to make this phase of mere sensational idealism once and forever patent.

In his later work, *Siris*, he gives utterance to views that put him quite in the line of Kant's later development of transcendental idealism.

### III. HUME.

Hume continues Locke and Berkeley in making psychology the basis of any possible epistemology and ontology, proving

however, the impossibility of both. He accepts their theory of ideas and is a sensational idealist—no more a materialist than a spiritualist. He accepts as unanswerable Berkeley's expulsion of material substance from the realm of knowledge, only going further and logically on the same ground, to expel the ideas of self and of God from the same realm of knowledge.

His mission was the *reductio ad ignotum* of all real being, on the ground of sensational psychology. Hume said that Berkeley's idealism admitted of no refutation. "The slightest philosophy," he said, "teaches us that nothing can ever be present to the mind but an image or perception, so that this perception or sensible image is the external object; nor can your reason ever find any convincing argument to prove that these perceptions or ideas are connected with external objects, as representations of them."

Hume substitutes the term "perception" for idea, for the mental unit in psychology. I can not, however, do better than to transcribe a page literally, with slight omissions, from the first part of *Book I* of the "*Treatise*."

"All the perceptions of the human mind resolve themselves into two distinct kinds, which I shall call Impressions and Ideas. The difference betwixt these consists in the degree of force and liveliness with which they strike upon the mind and make their way into our thought or consciousness. Those perceptions which enter with most force and violence we may name impressions; and under this name I comprehend all our sensations, passions, and emotions, as they make their first appearance in the soul. By ideas I mean the faint images of these in thinking and reasoning. \* \* \* There is another division of our perceptions which it will be convenient to observe, and which extends itself both to our impressions and ideas. This division is into Simple and Complex. Simple perceptions (or impressions and ideas) are such as admit of no distinction or separation. The complex are the contrary of these, and may be distinguished into parts. \* \* \* Impressions and ideas resemble in every other particular except their degree of force and vivacity. The one seems to be in a manner a reflection of the other, so that the perceptions of

the mind are double, and appear both as impressions and ideas. \* \* \* Every simple idea has a simple impression which resembles it, and every simple impression a correspondent idea; \* \* \* and as the complex are formed from them, we may affirm in general that these two species of perception are exactly correspondent. \* \* \* All our simple ideas, in their first appearance, are derived from simple impressions, which are correspondent to them, and which they exactly represent. \* \* \* The simple impressions always take the precedence of their correspondent ideas, but never appear in the contrary order. \* \* \* The constant conjunction of our resembling perceptions is a convincing proof that the one are the causes of the other; and this priority of the impressions is an equal proof that our impressions are the cause of our ideas, not our ideas of our impressions.

"To confirm this, whenever by any accident the faculties which give rise to any impressions are obstructed in their operations (as when one is born blind or deaf), not only the impressions are lost, but also their correspondent ideas, so that there never appear in the mind the least traces of either of them. \* \* \* 'Tis remarkable that the present question is the same with that which has made so much noise in other terms, when it has been disputed whether there be any innate ideas or whether all ideas be derived from sensation and reflection. \* \* \* Impressions may be divided into two kinds, those of sensation and those of reflection. The first kind arises in the soul from unknown causes; the second is derived in great measure from our ideas, and that in the following order: An impression first strikes upon the senses. Of this impression there is a copy taken by the mind, which remains after the impression ceases, and this we call an idea. This idea, when it returns upon the soul, produces new impressions, which may be called impressions of reflection, because derived from it. These, again, are copied by the memory and imagination and become ideas, which perhaps, in their turn, give rise to other impressions and ideas. So that the impressions of reflection are posterior to those of sensation and derived from them. The examination of our sensations belongs more to anatomists and natural philosophers

than to moral, and as the impressions of reflection arise mostly from ideas, it will be necessary to give a particular account of ideas before we proceed to impressions."

When an impression reappears as an idea it may do so "after two different ways. Either when, in its new appearance, it retains a considerable degree of its first vivacity and is somewhat intermediate betwixt an impression and an idea, or when it entirely loses that vivacity and is a perfect idea. The faculty by which we repeat our impressions in the first manner is called the memory and the other the imagination" (*Treatise*, part i, sections i, ii, iii).

This gives a condensed statement of his theory of the origin of knowledge. We see clearly that he makes impressions to be the ultimate standard and the touchstone of reality. He begins, he says, with ideas, and yet the gist of his whole contention, book by book and section by section, is this: Show me the impression from which the idea is derived, for if you can not the idea is a delusion, a mere will-o'-the-wisp; yet he has never once indicated to us how any single idea is thus derived. All he says is that impressions are ideas at a more vivid stage, and ideas are impressions at a less vivid one. Impressions, however, furnish Hume with what Reid called his "articles of inquisition." Of any philosophical term he says, "We need but inquire from what impression is that supposed idea derived. If you can not point out any such impression, you may be certain you are mistaken when you imagine you have any such an idea." This is the inquisition to which he subjects the idea of self and the idea of God, as we shall note later on. Hume no more used impression in a materialistic sense than did Berkeley, and gave even less ground than Locke for any such system of sensualism as that of Condillac. Hume clearly makes Berkeley's doctrine his own, as far as it concerns corporeal things; but what Berkeley showed of the cherry and the table Hume showed equally well, on the same psychological ground, of the self. Inner perception, impressions, and ideas show only activities, states of consciousness, but no self. He was really the father of that form of modern empirical psychology that refuses to recognize anything more than

"states of consciousness," of what is called "psychology without a soul." But the mere drip, drip of unconnected impressions do not give us knowledge. Our supposed knowledge comes from the relationing somehow of these single impressions. This leads Hume to question the origin and validity of the *relations* we use in connecting, unifying impressions and ideas, especially that of causality. Here he keeps close connection with his doctrine of the origin of knowledge, with his "articles of inquisition" in hand.

Berkeley's psychology as well as Locke's had no place for the relating tissue of knowledge. The relation of causality could not enter the mind through the senses. It could not be seen or felt. But both Locke and Berkeley put it all in the arbitrary will of God, not having deduced God from their psychological data. If Locke and Berkeley had shown how experience could testify to, could lead up as to its constant presupposition, to God, or to the rationality of the world, Hume would have had no psychological ground for questioning the validity of causality as a principle of knowledge. But adopting their psychology, and therewith expelling both the idea of self and of God from valid knowledge, he must find some other way to explain the illusive idea of causation, which he admitted that we have. He could find no warrant for it or authentication of it except *custom*. In fact, he here does little more than reproduce what both Locke and Berkeley said when treating of it psychologically, of the connection between ideas. Thus Berkeley says as to the relations we discover between ideas of sense, that they do not arise from any essential or necessary, but only a customary tie which has been observed between the ideas. Hume stops here with the customary tie, not finding his way, as Locke and Berkeley did *per saltum*, to a divine will as a source of causality. In fact, it is the only account he can give of it, on the theory of ideas or of relationless units of impression. To what impression does the idea of cause correspond? To none. It is therefore not a valid idea. But we have the illusive idea of it. Whence did it come—from what impressions? Hume answers, from customary sequence of different impressions and ideas. Hume did not deny that we attribute

causality to an antecedent, and effect to a consequent. What he denied was that we have any philosophical justification for doing so. We have simply, in his psychology, relationless ideas. As he says, "All events seem entirely loose and separate. One event follows another, but we can never observe any tie between them. They seem conjoined, but never connected." Thus Hume always insists that all that the Lockean psychology can give us is relationless atoms or ideas. Starting from these unrelated particulars, he had to show how the illusion of any constitutive relation or tie between them might arise.

We shall only stop to merely mention how many of these relations, even that of causality, Hume himself illogically uses throughout his treatise. He uses the relations of space and of time, holding, however, these to be given, intuitively given, along with the impression. Afterward he says, "The ideas of space and time are therefore no separate or distinct ideas, but merely those of the manner or order in which objects exist." Besides, he allows the idea of likeness and unlikeness of impressions, and of the different degrees of these. It is on this that he bases the demonstrative knowledge of mathematics as the sole demonstrative science. As to his unwarranted use of the relation of causality, I shall speak of it after I have shown how he afterward utterly denies its validity. I can not do this better than in his own words, as follows:

"We can never, by our utmost scrutiny, discover anything but one object following another, without being able to comprehend any force or power by which the cause operates, or any connection between it and its supposed effect. \* \* \* All events seem entirely loose and separate. One event follows another, but we never can observe any tie between them. They seem conjoined, but never connected. But as we can have no idea of anything which never appeared to our outward sense or inward sentiment, the necessary conclusion seems to be that we have no idea of connection or power at all, and that these words are absolutely without any meaning when employed either in philosophical reasonings or common life. \* \* \* It appears that this idea of a necessary connection among events arises from a number of similar instances which occur of the

constant conjunction of these events ; nor can that idea ever be suggested by any one of these instances, surveyed in all possible lights and positions. But there is nothing in a number of instances different from every single instance, which is supposed to be exactly similar, except only that after a repetition of similar instances the mind is carried by *habit* upon the appearance of one event to expect its usual attendants, and to believe that it will exist. This connection, therefore, which we feel in the mind, is the impression from which we form the idea of necessary connection.

"The first time a man saw the communication of motion by impulse, as by the shock of two billiard-balls, he could not pronounce that the one event was connected, but only that it was conjoined with the other. After he has observed several instances of this nature, he then pronounces them to be connected. What alteration has happened to give rise to this new idea of connection? Nothing but that he now feels these events to be connected in his imagination, and can readily foretell the existence of one from the appearance of the other. \* \* \* Similar objects are always conjoined with similar. Of this we have experience. Suitably to this experience, therefore, we may define a cause to be an object followed by another, and where all the objects similar to the first are followed by objects similar to the second. Or, in other words, where, if the first object had not been, the second never had existed." (*Inquiry*, section 7.)

Again, in a foot-note to section 8, part i, he says :

"If a cause be defined that which produces anything, it is easy to observe that producing is synonymous to causing. In like manner, if a cause be defined that by which anything exists, this is liable to the same objection. Had it been said that a cause is that *after* which anything constantly exists, we should have understood the terms. For this is indeed all we know of the matter. And this constancy forms the very essence of necessity, nor have we any other idea of it."

He urges us to resist all these irrational promptings of the imagination, and to remain content with our separate perceptions, and adds: "Since all our perceptions are different from

each other and from everything else in the universe, they are also distinct and separate, and may be considered separately existent, and may exist separately and have no need of anything else to support their existence." We have given only casual, never causal connection.

It is no wonder, then, that he can not know an underlying self, which has these independent, separate impressions or ideas. Here he brings his old "articles of inquisition" to bear on the conception of a self. He says :

"From what impression could this idea be derived? If any impression gives rise to the idea of self, that impression must continue invariably the same through the whole course of our lives, since self is supposed to exist in that manner. But there is no impression constant and invariable. Pain and pleasure, grief and joy, passions and sensations succeed each other and never all exist at the same time. It can not, therefore, be from any of these impressions or from any other, that the idea of self is derived; and, consequently, there is no such idea."

He puts it down as an illusion of the imagination, without, however, accounting for imagination. Again he says: "When I enter most intimately into what I call myself, I always stumble on some particular perception of heat or cold, light or shade, love or hatred, pain or pleasure. I never can catch myself at any time without a perception and never can observe anything but the perception. When my perceptions are removed for any time, as by sound sleep, so long am I insensible of myself and may be said not to exist." Again, "Men are nothing but a bundle or collection of different perceptions, that succeed each other with inconceivable rapidity, and are in a perpetual flux or movement. There is properly no simplicity in the mind at one time, nor identity at different times." It has been noted (*Cyc. Brit.*, art. *Hume*) that Hume skillfully avoids the demolition of this idea of a self till the close of the *Treatise*, while really using it throughout, in the work of criticism on the idea of substance, causality. If he had begun with this demolition of the idea of a permanent self, all his positive criticisms of the other illusions would at once have been seen to be themselves but illusions—dreams of a dream—not even

of a dreamer. He has dissolved all substances and all relations, and consequently has to give us as a theory of cognition only a rope of sand.

We have, and know, and are nothing but the continuous drip, drip of unrelated particular impressions and ideas. In a word, he endeavored to account for all our judgments of relation as the work of the imagination, as the mind's "propensity to feign" in combination with the operation of custom. "Custom-bred association" is all his psychological theory will afford him as the ground and cause of all the connective principles which the mind uses in knowing. He sometimes calls these natural relations.

In regard to all the inductive sciences and all that depends upon the relation of causality he is very explicit. In none of them can the mind attain adequate or valid knowledge—*i. e.*, no other validity than that afforded by the custom-bred association of ideas. He denies that we can by experience learn anything as to the future, present impressions being our only scientific data. So-called scientific prediction is with Hume unscientific. Our faith in induction is scientifically unfounded. His attack upon natural science is very frank and pronounced, following necessarily from the value he gives to induction and the principle of causality. All our knowledge of the connection of facts and events, except that of contiguity and resemblance (why?), he pronounces to be worthless sophistry when put forward as real knowledge. His attitude toward the empirical sciences of nature is that of probabilism. He tells us "that the supposition that the future will resemble the past is entirely derived from habit, by which we are determined to expect for the future the same train of objects to which we have been accustomed." The child burned once, not often, as his theory of custom demands, may dread the fire, but he has no scientific knowledge that the fire will burn him the next time. Our inductions, expectations as to the future are made up of the mere successions of our own feelings put together by the mind's "propensity to feign" (his favorite expression) and by *custom*.

In all this there is no place for the doctrine of the uniformity

of nature, which serves so large a part in modern inductive science, nor for the laws of nature, which he elsewhere uses to disprove miracles. A firm belief in miracles may, on his theory, be accepted as embodying just as much knowledge as a firm belief of similar extent to the contrary. The only logical way for him to disprove miracles would have been to show that they have never, to any large extent, been believed to occur. But this only in passing and as connected with his view of what laws of nature really signify. I may only add that Hume never denied the existence of God or impugned revelation, and that he was recognized as a reasonable conformist to religious practices. His final word in regard to all such matters was no other than his final word concerning natural science, the laws of nature, etc.—*i. e.*, one of doubt and uncertainty, intellectually.

Experience, then, can not be the parent of knowledge, can not teach all things, but only beget custom-woven feelings of expectation and association. The only primary real is impressions, and, second, ideas as faint images of these, all the thinking, all the connecting web of thought being association of feelings, and mind being but a fainter copy of a mass of successive isolated impressions, with a certain "propensity to feign." All thought is but a weaker form or copy of actually isolated, but custom and feeling-woven, present impressions. Show me the impression, he always says, from which any one of these connective tissues of thought comes, and I will show you the utmost epistemological validity it can have.

Thus we have him reach a logical theory of nescience from the ultimate realities in what we may term Lockean psychology.

Criticism is not here our purpose, nor have we the time for it; but in an appendix to the *Treatise* he expresses very frankly his own opinion on his critical work. He says: "If perceptions are distinct existences, they form a whole only by being connected together. But no connections among distinct existences are ever discoverable by human understanding. We only feel a connection or determination of the thought to pass from one object to another. It follows, therefore, that the thought alone feels personal identity when, reflecting upon the

train of past perceptions that compose a mind, the ideas of them are felt to be connected together and naturally introduce each other. However extraordinary this conclusion may seem, it need not surprise us." In speaking of personal identity as held by some modern philosophers, he adds: "But all my hopes vanish when I come to explain the principles that unite our various perceptions in our thought or consciousness. I can not discover any principle which gives me satisfaction on this head. In short, there are two principles which I can not render consistent, nor is it in my power to renounce either of them, viz., that all our distinct perceptions are distinct existences, and that the mind never perceives any real connection among distinct existences. Did our perceptions but inhere in something simple or individual, or did the mind perceive some real connection among them, there would be no difficulty in the case."

Hume, it may be said, was not a practical skeptic. His skepticism was that of the understanding, showing its inability to know reality. His constructive work was to show the inadequacy of the merely psychological method for the solution of philosophical problems. It showed the folly of all dogmatism of mere empiricism, leaving Kant to begin anew the fuller description and analysis of experience and to show the transcendental elements in every act of the mind, in perception as well as in conception. Kant had a truer insight into experience, in the larger sense of the term, and he was forced to make an analysis of this, because Hume had shattered all dogmatism on the mere ground of the narrower experience of empiricism.

Hume's system did not refute the previous systems. It only showed the inadequacy of the psychological epistemology of Locke and Berkeley to the ontological results they reached, ontological results that form a part of real experience, toward the fuller analysis of which Kant did the next great work.

Hume's skepticism, I have said, was that of the understanding or of an epistemology analyzed out of empirical psychology. From this he could find no warrant for the belief on which rest alike the experiences of daily life and also all the inductive

sciences. Tracing the origin of our ordinary and of our scientific beliefs from empirical and isolated psychological data, he could find no rational validity for them. Hume did not practically doubt, and did not fail to act in accordance with, the existence of the idea of causality, but he showed its epistemological non-validity on the ground of merely empirical psychology. He accepted and lived on the ordinary belief of an external world and of an internal self and of a Supreme Being, though he could not justify these beliefs on any theory of knowledge founded on his psychology. If any one asks him if he is really one of those skeptics who hold that all is uncertain, he replies: "Neither I nor any other person was ever sincerely and constantly of that opinion. Nature, by an absolute and uncontrollable necessity, has determined us to judge as well as to breathe and feel." He falls back upon the unreasoned belief, upon the irresistible belief of man, "implanted in men and rendered unavoidable by nature," in spite of the proven non-validity of these beliefs. "Nature," he adds, "has not left this to our choice (to thus believe), doubtless esteeming it an affair of too great importance to be trusted to our uncertain reasonings."

This, then, is the dilemma to which Hume has brought us. Not, as Lewes says, to renounce philosophy, but to enlarge the experience which we analyze.

Hume's contention is that the moment you begin to be rational—to know only what you can know by an analysis of the experience yielded by an empirical psychology—you must give up the validity of those beliefs on which the whole of life and science rests. The contention which critical thought soon brought forward was that the experience which he analyzed was not experience—that is, isolated impressions and chaotic ideas, with no connection other than that of continuity—that this experience was the mere world-stuff woof, with the warp and the pattern left out. It would be interesting to read some further comments of his own on the impossibility of real knowledge to which his speculations led him. They would show that he believed that his philosophy was one which must be abandoned, in order to perform the ordinary and indeed the necessary duties of life, in order to live at all. They would also

show that his philosophy was not a philosophy of experience, but of lifeless chaos. The philosophical impulse to rationalizing this world was as strong in Hume as possible. Failing in this, he was a philosophical skeptic. To live in a non-rationalized world is impossible for a rational man, and it is not wonderful that his "*Essay on Suicide*" should have taken the ground that it is not a crime.

No system of philosophy has ever been refuted. Hume did not refute his predecessors, and his successors, Kant and Hegel, have not refuted him, in the absolute sense of the term. To show this would mean an essay on the function of the skeptic in philosophy, or on the positive function of the negative—of the dialectic.

The German word *Aufheben* has the double signification of (1) to destroy or annul, (2) to fulfil and to retain. Thus the Gospel abrogates, destroys, annuls the law, and yet fulfils it, retains it in transmuted form as an element of itself, just as the fruit does the blossom. Philosophy is a progressive effort toward a fully articulated system of the world of experience as rational. Each system retains for all time a certain relative validity. Plato and Aristotle, Hume and Kant, will never be obsolete. The great insights of these great thinkers are essential elements in our own largest views of experience. Without knowledge of them we can not properly orientate ourselves in our problem of rationalizing the world. The music of Wagner would have been impossible without that of his great classical predecessors. So Kant would have been impossible without Hume, and Hegel without Kant, and all of them without Plato and Aristotle. At the very least, it can be said that his philosophical nescience created by antagonism that fuller analysis of our own synthetic experience, wrought out by Kant and completed by his successors, of whom we are to hear from others in the succeeding papers before this "Society for Philosophical Inquiry."

## II.

### BISMARCK AS A CLASSIC.

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Bismarck's immense personality, in spite of volumes filled with the records of his deeds by the foremost historians, is even today unexplored. Our limited mission is the characterization of Bismarck's literary work incidental to his active life, and in this regard it is scarcely possible to exaggerate his importance. Since Cæsar's "*Commentaries*," and perhaps Frederick the Great's "*Histoire de Mon Temps*," there has probably been no more important autobiographic publication of any statesman's own work than Bismarck's parliamentary speeches and his political correspondence. Although not endowed with great oratorical gifts, he is perhaps the foremost literary classic of modern political eloquence, the most impressive and incisive parliamentary mover of mind and matter by the mighty substance and irrefutable logic of his thought and expression. There is nothing in Bismarck's speeches that reminds one of Cicero's elaborated periods—full of mere beauty, vanity, sentimentalism, appeal to the emotions, self-praise, demonstrativeness, and looseness of thought; there is everything that reminds one of the classical compactness, earnestness, patriotic passion, and persuasiveness, the rich substance behind every idea, which we admire so much in Demosthenes.

The farther we shall be removed from Bismarck by the process of time, the greater his practical politico-literary work will appear to us, based as it is upon the solid foundations of truth and nature, of reality and the forcible evolution of what must be, of what is inevitable. There is the concentrated German spirit personified by the most intensely German genius ever produced by that nation, infinitely rich intellectually and spiritually; there are the events of the formation of the modern German Empire, so fruitful to general history, reflected in the truthful literary outpourings of the founder himself.

Bismarck is no "problematic nature," in Goethe's sense, but one who understood the German innermost soul and the struggling spirit of his era, and who made all the helpful as well as the immense resisting forces of the nation—without any assistance from without—subservient to the attainment of one great and positive goal: the unification of hopelessly disrupted, distracted, centrifugal Germany, a geographical conception, under the disgraceful spell of foreign, hostile, and antinational powers.

There are only two superhuman men who can in this respect vie with Bismarck—Washington and Cavour—all three predestined to foresee, to connect the hidden forces of union among the millions of human units conscious, or frequently even unconscious, of their essential identity. All three are not the creators but the inspired leaders of what the great historian Treitschke calls *Einheitsbestrebungen geteilter Völker*.

When the fragmentary—alas, only too fragmentary!—politico-literary and epistolographic sections from Bismarck's work are offered to American students and readers,\* it is thought not so essential to add merely to the knowledge of his time and his personality as it is to extend the educational field by the addition of a new classic to the sum total of those who furnish the intellectual, spiritual, and moral food to the rising generation. If the simple grandeur and unparalleled achievement of Washington gave the incentive and impulse to the French Revolution, which again, through its blessings as well as through the curse of its terrible excesses, aroused the slumbering longings of all nations for liberty without license, for self-determination, equality before God and the Law, the right of resistance to tyranny and oppression, active citizenship, and consequent constitutional government with all its concomitant blessings, Bismarck's life and work, his Titanic efforts for the political emancipation of the great, gloriously endowed German nation, his parliamentary orations, memorials, decisions, despatches—even his errors and faults—have made him not only the greatest political teacher of his nation, but will also

\* "Bismarck's Letters and Speeches," by Hermann Schoenfeld, Professor in the George Washington University. Published by D. Appleton & Co., to appear January, 1905.

furnish to us the educational significance of such work by comparison—*mutatis mutandis*. The more we imbue ourselves with the treasures of thought, of achievement, of all that is great and good and noble in other civilized nations of first magnitude, the higher will our own national culture rise. In this broadest cultural sense did Goethe understand the wise adage: He who knows no foreign language (*i. e.*, all the intellectual treasures which it conveys) knows nothing of his own. The constant stream and current that flows to and fro between nations, enriching them mutually, is a sealed book to him. He knows nothing of his psychic origin.

To understand modern Germany in the evolutionary process of what she was before and during Bismarck's heavenly appointed mission, of what she is today in undiminished greatness, so far as she carries out her legacy, declining so far as she deviates from it, one must study the various phases of Bismarck's life and work, his purposes, his wars, his gigantic efforts to avert wars, his alliances, his moderation in victory, his trust in God, his *Kulturkampf* and his defeat by the consolidated, apparently eternal power of the church universal, his anti-socialist legislation and his socialistic remedies, his use of parties, his inner struggles and tactical moves, his absolutism and squirearchy, his political conversion and again his constitutionalism, parliamentarism, his checks and counter-checks in the balancing of executive and legislative forces. He removed the débris of older antiquated state formations which obstructed the road to the building up of the new empire. He stopped up the source of German discord and the incompatible dualism between Prussia and Austria within Germany by bringing to the head of warlike decision clashing and conflicting problems which could in no way be decided without resorting to arms—"the cutting by force of the Gordian knot" (*"Die Kritik der entarteten, verwücherten, unmahrgewordenen Zustände," Droysen*). He forced the opposed and impossible extreme parties—the absolutistic-feudal, people-enslaving one, and the radical state-destroying one—into the state service by teaching the former, to which he had belonged in his youth with reactionary stubbornness, that it was in vain to try to keep alive

antiquated privileges, and that they must place their services at the disposal of a *constitutional* state if they were to retain their traditional influence commensurate with their economic and social power. He brought the liberals to a sense of moderation in their notions of extreme liberty, and taught them that French and Belgian parliamentary practices should not all be introduced into Germany, but that the political customs and traditions and popular convictions, founded upon the evolution of German history, must be recognized. Only in this way could the German people, reared under manifold and different political conditions, be turned toward a realization of their ideals of liberty while remaining true to their monarchical tendencies. In three decades he accomplished not only the new foundation, but fortified it beyond human measure, within and without, for the extra-European mission of a world power.

The classical prose of Bismarck's language is naturally differentiated according to the requirements of oratory, political despatch, and epistolography. In all three branches he is equally original; in all three his language is free from inane phrases and abstractions, which he despises; in his language he is as much of a realist as he is in statesmanship. After first crystallizing the substance and contents in his mind which harmonize with his action or his purpose, he evolves as it were originally the pregnant realistic word. His earnestness, profound conviction regarding what he desires and what must be attained, cause his speech or his state document to be filled with convincing and elemental force. Everything with him is substance, as with Demosthenes, Shakespeare, Goethe. He had a literary instinct for effective presentation and dramatic point. The written or spoken word must convey a definite and real meaning; it must affect and convince the minds of his hearers and readers, and his hearers and readers were the entire civilized world; and this effect must be attained by the speaker who is in no way a great orator. Mr. Andrew D. White, the American statesman and author, who represented America twice during Bismarck's chancellorship, once characterized his speaking thus:

"He appears to put forth all his strength in order to get his words out. His speeches are generally a great deal too long, although at first he seems to be at a loss what to say. He puffs and snorts, as it were, and utters ill-founded assertions, and phrases which appear to have no meaning. Then, all of a sudden, one hears a sentence sufficient of itself to explain his whole policy, an expression which of itself suffices to floor his opponent, or a word which electrifies the nation, among which it circulates like wildfire. After this there will be a few more reminiscences of the past, and suddenly again, in the midst of these, he gives an historical illustration in the highest degree convincing. Finally, after a few personal observations, he gathers up his arguments, and then follows a direct provocation launched in the face of an adversary, followed by an appeal to the whole German nation, to future generations, etc., which never fails to produce a stirring effect. I have known many clever speakers, but I have never known one capable to the same degree of electrifying his audience and carrying the whole country with him."

The statement that Bismarck ever uttered "phrases that appear to have no meaning" is surely ill-founded, but that there are many contradictions in his works at different periods is undeniable. On this subject he says himself:

"Ich gehöre allerdings nicht zu denen, die jemals im Leben geglaubt haben oder heute glauben, sie könnten nichts mehr lernen, und wenn mir einer sagt: vor zwanzig Jahren waren Sie mit mir gleicher Meinung, heute habe ich dieselbe Meinung noch, und Sie haben eine entgegengesetzte, so antworte ich ihm darauf: ja so klug wie Sie heute sind, war ich vor zwanzig Jahren auch, heute bin ich klüger, ich habe gelernt in den zwanzig Jahren. Aber ich will mich auf diesen berechtigten Einwand nicht zurückziehen, daß ein Mensch, der nicht lernt, nicht fortschreitet mit seiner Zeit und also auch der Zeit nicht gewachsen bleibt; der bleibt zurück, wer feststeht auf dem Standpunkt, den er einmal gehabt hat. Ich will mich damit gar nicht entschuldigen, für mich hat immer nur ein einziger Kompaß, ein einziger Polarstern, nach dem ich steure, bestanden: das Wohl des Staates . . . Doktrinär bin ich in meinem Leben nicht gewesen, alle Systeme, durch die die Parteien sich gebunden und getrennt fühlen, kommen für mich in zweiter Linie . . . Die Doktrin gebe ich außerordentlich

wohlfeil, in welcher Weise mit mehr oder weniger liberalen Verfassungseinrichtungen das Haus zu möblieren sei. . . . Man kann es so machen oder so, es gibt viele Wege, die nach Rom führen. Es gibt Zeiten, wo man liberal regieren muß, und Zeiten, wo man diktatorisch regieren muß; es wechselt alles, hier gibt es keine Ewigkeit. Aber von dem Bau des deutschen Reiches, von der Einigkeit der deutschen Nation, da verlange ich, daß sie fest und sturmfrei dastehe und nicht bloß eine vorübergehende Feldbefestigung nach einigen Seiten hin habe. Seiner Schöpfung und Konsolidation habe ich meine ganze politische Thätigkeit vom ersten Augenblick, wo ich begann, untergeordnet, und wenn Sie mir einen einzigen Moment zeigen, wo ich nicht nach dieser Richtung der Magnetnadel gesteuert habe, so können Sie mir vielleicht nachweisen, daß ich geirrt habe, daß ich das nationale Ziel einen Augenblick aus den Augen verloren habe". (February 1, 1881).

What a style, what a perspective, what a confession of his noble contradictions and errors in behalf of his country, what a classicism in form and contents, in spirit and in thought!

Wilhelm Oncken said in a lecture, April, 1901, in Vienna: "Varzin was his joy; every tree, every bush, every hedge was known to him; he led me to every view which he had created, and there it dawned upon me: Here is the fountain of life, where he drinks his eternal youth, in his forest, under his trees. With childlike joy he led me into the deepest thicket of the park and said, deeply breathing: 'No despatch reaches me here!'"

There in the forest, under the linden trees and the oaks, the German trees *par excellence*, the odor of which pervades all Germanic literature, is to be found also the charm of Bismarck's Bildersprache. His word-pictures and pictorial words are, however, never a mere ornament, but rather an instrument of enlivening illustration or illumination of facts, hard facts. In the school of phrases in the Diet of Frankfort, in that mendacious, cockney world of idle phrases, of lies, of ridiculous diplomatic conventionalism, there appeared this man as of another world, with his straightforwardness and veracity, this diplomat "in wooden slippers," who soon made the conventicle groan, and yet what he said was the truth, and nothing but the truth. That German world built, against its own nature,

upon such a phraseological substructure was untenable. Here also, in the German language, Bismarck fulfilled his original pioneer mission of reform. Not that there was not already the language of the greatest thinkers and poets in existence, but it was the language of political inactivity and weakness, of contemplative philosophy and history, either retrospective of its ancient national deeds, or contemplative of the deeds of other nations. One only needs to compare the stilted, romantic, unrealistic, though beautiful, language of Frederick William IV, the esthetic king, with that of Bismarck to realize that we are at the parting of the ways. Bismarck's language in itself indicates a new era, another atmosphere. One is tempted to repeat Ranke's phrase, applied to another transformation period, the Renaissance: "The deeper one enters the more one becomes aware of another world of thought, a different form of expression, a different cycle and context of those spiritual tendencies which dominate all the new creation, another sky and another earth." In one word, there is another *"Weltanschauung."* Bismarck inculcated into the old language the spirit of reality, the genius of action. He took his figures and tropes from his world of forest and field, from nature, from the school of reality. He took his facts from reality and experience, not from theories or doctrines. So May 2, 1879:

"In allen diesen Fragen (i. e. economic) halte ich von der Wissenschaft gerade so wenig, wie in irgend einer anderen Beurteilung organischer Bildungen. Unsere Chirurgie hat seit zweitausend Jahren glänzende Fortschritte gemacht, die ärztliche Wissenschaft in Bezug auf die inneren Verhältnisse des Körpers, in die das menschliche Auge nicht hineinsehen kann, hat keine gemacht, wir stehen demselben Rätsel heute gegenüber, wie früher. So ist es auch mit der organischen Bildung der Staaten. Die abstrakten Lehren der Wissenschaft lassen mich in dieser Beziehung vollständig kalt, ich urteile nach der Erfahrung, die wir e r l e b e n. . . . So wenig wie die Frage des menschlichen Körpers, von der ich sprach, so wenig, behaupte ich, gibt es einen, der mit unfehlbarer Gewissheit sagen könnte, dies ist die Frage der und der wirtschaftlichen Maßregel." And again, March 28, 1881: "Es handelt sich (i. e. in economic and political questions) nicht um exakte Wissenschaften, sondern um Behandlung von Organisationen, um lebendige Körperschaften, deren Wesen

ebenso wenig von den Menschen seziert und ergründet worden ist, wie das des einzelnen menschlichen Körpers von den gelehrtesten Ärzten; soweit das Auge hinreicht, soweit die Chirurgie thätig ist, haben wir ganz außerordentliche Leistungen, in der Behandlung innerer Krankheiten aber sind zu unsrem und der Ärzte Bedauern die Fortschritte der Wissenschaft seit der Zeit, die uns die Geschichte zugänglich gemacht hat, nur gering gewesen, und deswegen sind auch die Ärzte mir die liebsten, die Erfahrung haben und zu Räte ziehen, wenn Sie wollen: Empiriker, wenn man sie beleidigen will, wenn man sie braucht: erfahrene alte Herren. Und so ist es auch in der Politik, in der Nationalökonomie, in der Statistik;<sup>1</sup> die Wissenschaft ist da mitunter auf einem sehr hohen Pferde, aber sie steht den Boden nicht, auf dem sie reitet, und erkennt ihn nicht!—April 2, 1881: „Keine politische Frage kommt überhaupt zu einem vollständig mathematischen Abschluß, daß man Bilanzen nach den Büchern ziehen kann; sie stehen auf, haben ihre Zeit und verschwinden schließlich unter anderen Fragen der Geschichte, das ist der Weg einer organischen Entwicklung. Ich halte es für meinen Beruf, diese Fragen ohne Parteileidenschaft, ohne Aufregung in Angriff zu nehmen, weil ich nicht weiß, wer sie mit Erfolg in Angriff nehmen soll, wenn es die Reichsregierung nicht thut.“—January 9, 1882, again he meets the reproach of ignorance raised against him by some deputy: „Ich bin nicht durch die Weiße der öffentlichen Wahl gegangen und bin deshalb auch nicht in der Lage, über alle Dinge der Welt eine feste, unabänderliche Meinung rasch in promptu zu haben, sondern ich überlege mir die Dinge selbst, und wie ich in meinem Konzept über wichtige Sachen viel streiche, viel ändere, sie lassere und neu bearbeite, so ist es auch in diesen Fällen.—Ich glaube nicht, die Dinge . . . so zu durchschauen, daß meine Meinung nicht der Belehrung und Umänderung unterworfen wäre“.

In this way Bismarck gives a clue to his mode of work, and confesses that he takes nothing for granted *a priori*, but that all his work is the result of profound, independent thinking, conscientious search, and subject to change.

<sup>1</sup> And yet how strong he is in statistics, many of his speeches show clearly, e. g. May 21, 1879, only he objects to the „politisch sehr tendenziösen Statistik, wie sie in Preußen gemacht wird“, which reminds one of the statistics prepared among us for political purposes before elections. Otherwise Bismarck is no stranger to mathematical deductions, when he says: „Wir ziehen nach Möglichkeit die Diagonale der Kräfte, die thatsächlich vorhanden sind; wird die eine Kraft größer, dann bekommt die Diagonale eine andere Richtung“. (May 24, 1870).

In spite of all his modesty, his knowledge and his intuitive grasp of things and processes are marvelous. On all possible subjects that fall to the domain of the infinitely complex state-machine, Bismarck strikes the student of his speeches, and those of his adversaries, as well nigh infallible. With what success he measures himself with the foremost specialists and experts in that domain which each had made peculiarly his own! One is under the impression that the one man is equal to the sum of all the others, and this can be said without disparaging the greatness of the others. Here he silences the great political teacher Gneist on a point of international or constitutional law; here the excellent Miquel in the question of railways; here Eugen Richter, the statistical genius, in the question of the Russian timber tax; there again the eminent socialist and „Großkaufmann“ Loewe on some industrial point.

Even the mighty leader of the Centrists, Windthorst, who knows the history of his church in all its details, or the unequaled historian of Rome, Theodore Mommsen, are sometimes utterly refuted by him in their respective specialties. Nothing escapes his knowledge. He knows the rivers of Russia, whether navigable or not. He is familiar with the durability of Russian, Prussian, and American oak and pine trees. “The German trees,” he says, “we know to have lasted two, three, five hundred years. No one knows whether the American pitch pine would last ten years.” He knows the economic condition of every state. “I see that the countries with free trade retrograde, and great, mighty England, the strong champion, who, after having strengthened his muscles, stepped forth upon the markets of the world and said, ‘Who will fight with me? I am ready for everything’—this country also returns gradually to protective tariff, and will in a few years adopt it in order to insure at least the British market.” Is this a prophet or merely a genius?

It is impossible within the limits of this paper to cite here any of those numberless passages which shine in classic beauty and richest philosophical depth in Bismarck's works. Bismarck and the world surrounding him—his king, his colleagues, and minor officials; Bismarck and the German nation; Bis-

marck and the parliament, the press, the relations with foreign nations; Bismarck as an economist; Bismarck and his family, his love and his hate, his friends and his enemies; Bismarck and art (for he is on terms of friendship with the great painters and musicians, especially Lenbach, and Anton Von Werner, and the greatest German composer, Richard Wagner); Bismarck and the monarchy, absolutistic or constitutional; Bismarck and religion—are illuminated best from his own works, through which his life may be reconstructed if the student can only encompass the universality of his genius.

Two elements of his work must be merely noticed—his characterization of nations, personalities and of himself (with a wonderful estimate of his own soul, his weakness and his power), on the one hand, and his happy use of literary, historical, and biblical sources, which cause his works to abound with literary gems and strongly affect organically his own classicism. Besides, Bismarck's speeches contain such abundance of pithy sentences, striking proverbs, such treasures of popular wisdom, that the study of them merely as literature, regardless of the political and historical contents, is of extreme value. There are gems of good-natured humor and sarcastic wit, biting irony, oratorical repartee; there is the flash of spiritual lightning, striking „Schlagworte," which the German people have coined for every-day use, original applications of adages which have forever enriched the language. There are numberless pithy quotations from classical authors at his disposal, in the use of which he displays a remarkable intuition of their effect upon the mind or feelings. Latin verses with most characteristic application abound, as, for example, his reference to "poor human beings," "*Fruges consumere nati*" (Horace). So also, speaking of the heavy responsibility weighing upon him, he quotes "*Post equitem sedet atra cura*" (Horace). Other notable passages are Terence's "*Miles Gloriosus*" for a brawler, Virgil's "*Timeo Danaos et dona ferentes*," and "*Iliacos intra muros peccatur et extra*," and Horace's "*Metuentes verbera linguae*." He exhibits at all times the greatest familiarity with the Bible, Goethe, Schiller, and Shakespeare. French literary sources are frequently used for effective parallel,

as, Rousseau's "*Contrat Social*," Beranger's "*King of Yvetot*," etc. His range of knowledge even reaches to American authorities, for Kent's "*Commentaries on American Law*," vol. I, p. 244, is cited when he desires to protect his personal honor from insult, and to show the proper restrictions of parliamentary liberty of speech.

Thus his soul is reflected truthfully in his language, the details of which are presented in the larger work now in process of publication. The contrasts of his spirit appear in his works, so that they display the most varied human emotions. His genius was human, after all; his world was Europe and his center of the world Germany. Did he not concentrate his immense genius exclusively upon the mighty task of uniting Germany in order that he might not be diverted from this lofty mission by the tremendous extra-European events that were preparing at his death—*Ex Oriente Lux?*

### III.

## AMERICAN CONTRIBUTIONS TO THE SCIENCE OF POLITICS.

BY HANNIS TAYLOR, LL.D. (EDINB. AND DUBL.)

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Nearly three centuries have passed by since the foundations of the political system of the United States were laid. The outcome of the growth that has taken place during that time is five path-breaking principles which may justly be regarded as original contributions to the Science of Politics, in the Aristotelian sense of that term. They may be catalogued as follows: First, the principle of constitutional limitations on legislative power, of which the European world knew absolutely nothing; second, the principle of interstate citizenship, which, in the words of Mr. Bancroft, "infused itself neither into the constitution of the Old-German empire, nor of Switzerland, nor of Holland"; third, the principle that a federal government may be made to operate directly upon individuals and not upon states or cities as corporate bodies; fourth, that the federal head may be divided into three departments—legislative, executive, and judicial—as in the case of a single state; fifth, the principle represented by the Supreme Court of the United States, the first tribunal in history ever endowed with the power to pass on the validity of a national law.

### THE TYPICAL ENGLISH STATE IN AMERICA.

The power to subdue and settle a new country, through the establishment of a set of local self-governing communities, and then to build up a state through their aggregation constitutes the strength of the English nation as a colonizing nation. That process, so successfully employed by the Teutonic invaders who came from the mainland into Britain in the sixth and seventh centuries, was simply repeated by their descendants who settled permanently on the Atlantic seaboard in the seventeenth. Through that process, capable under favorable geo-

graphical conditions of unlimited expansion, has been built up the federal republic of the United States. It may be stated as a general rule that the English colony in America, like the English kingdom in Britain, represented an aggregation of counties, and that each county represented an aggregation of towns or townships. In some instances the colony was formed by the coalescence of local communities before a charter was granted; in others the charter was granted first and the colony then subdivided into districts as the local communities were organized. After the tie of political dependence which bound the colonies to the mother country had been severed, they rose at once to the full stature of sovereign states. When the offspring is compared with the parent, when the typical English state in America is compared with the English state in Britain, the resemblance is too close for the relationship to escape the most careless observer. When the State of Virginia, for instance, is compared with the Kingdom of England—standing apart of course from Wales, Scotland, and Ireland—it appears that in both the political substructure is the same, the ancient self-governing communities known as counties, towns, or townships. In each, strictly municipal organization rests upon substantially the same basis. In the higher domain of power the central organization of every American state is a mere reproduction of the central organization of the English kingdom, with such modifications as have necessarily resulted from the abolition of nobility, feudality, and kingship. In the new as in the old, the central powers of the state are divided into three departments—legislative, executive, and judicial—which, in the same qualified sense, are separate and distinct from each other.

INVENTION OF CONSTITUTIONAL LIMITATIONS ON  
LEGISLATIVE POWER.

In coming into being the typical English state in America contributed to the world a brand-new political principle of the most profound and far-reaching character. I speak of the principle of constitutional limitations on the legislative power, a principle of which the European world knew nothing, a

principle which rests upon the doctrine of the sovereignty of the people as distinguished from the sovereignty of Parliament. Such limitations naturally arose out of the process through which American legislatures came into existence. From the very beginning the powers of the colonial assemblies were more or less limited through the terms of the charters by which such assemblies were either created or recognized; and even in colonial times "questions sometimes arose . . . whether the statutes made by these assemblies were in excess of the powers conferred by the charter; and if the statutes were found in excess they were held invalid by the courts—that is to say, in the first instance by the colonial courts, or, if the matter was carried to England, by the Privy Council."\* When the tie of political dependence on the mother country was severed that supreme revisory power passed from the crown into the corporate person of the state itself. Thus it was that the new American state legislatures were not endowed with the ancient omnipotence of the English Parliament. Such omnipotence passed to them subject to a still higher law—the will of the people as embodied in the limitations of the state constitution. In Connecticut and Rhode Island the colonial charters were continued as state constitutions for a long period of time, and it is worthy of note that one of the first cases in which an act of a state legislature was declared void because repugnant to the principles of a state constitution was that of *Trevett v. Weeden*, decided by the Supreme Court of Rhode Island in 1786. The fundamental distinction that divides the English constitutional system from that developed in the American states is embodied in this principle of constitutional limitations on the legislative power, and not in the really immaterial fact that in one system the constitution is recorded in a single document and in the other in many.

#### EFFECTS OF GEOGRAPHY ON FEDERATION IN AMERICA.

In order to ascertain the real reason why the English states in America were confederated in a single body, and not con-

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\* Bryce, *Am. Commonw.*, vol. I, p. 243.

solidated in a single body, we must contrast the map of Britain as it appeared in the eighth century with the map of our Atlantic seaboard as it appeared in the eighteenth. On the first map we find the seven or eight larger aggregates, generally known as the heptarchic kingdoms, confined within the narrow and impassable limits of an island world, where it became their manifest destiny, from reasons purely geographical, to advance in the path of political aggregation, to coalesce in the formation of a single consolidated kingdom. In other words, the heptarchic states were simply crowded together by a physical environment which made political expansion impossible. On the second map we find the thirteen colonies, with the same historical origin and with substantially the same political organization, situated upon one side of an almost limitless plane, where it became their manifest destiny, for reasons purely geographical, to advance along the path of political confederation, to unite in the flexible bonds of a federal system capable of unlimited expansion. In making that radical departure from the political experience of the mother land, the English states in America were forced to look to new sources for light and guidance, so far as the principle of union was concerned, because of the federal principle the mother land knew absolutely nothing.

#### FEDERALISM IN ITS ANCIENT FORM.

From the days of the Greek leagues down to the making of the first federal constitution of the United States embodied in the Articles of Confederation, political thinkers had conceived of but one type of a federal union. Down to that time the Achaian League, the Confederation of Swiss Cantons, the United Provinces of the Netherlands, and the German Confederation really represented the total advance which the world had made in the structure of federal governments. Such advance was embodied in a federal system made up of a union of states, cities, or districts, representatives from which composed a single federal assembly, whose supreme power could be brought to bear not upon individual citizens, but only on cities or states as such. The fundamental principle upon which all such fabrics rested was the requisition system, under which

the federal head was simply endowed with the power to make requisitions for men and money upon the states or cities composing the league for federal purposes, while the states alone, in their corporate capacity, possessed the power to execute and enforce them. Excepting the important invention of interstate citizenship, the framers of our first federal constitution made no advance whatever on the world's past experience. The Articles of Confederation simply embodied a union on the old plan, with the federal power vested in a single assembly, which could only deal through the requisition system with the states as states. As all the world knows, federalism, which as a system of government already stood low enough in the estimation of mankind, was put in no better plight by the first American experiment. So attenuated had that experiment become at the end of the Revolutionary struggle that the one cohesive force which really held the states together was not a constitution but a man, and that man was Washington.

THE INVENTION EMBODIED IN THE SECOND FEDERAL  
CONSTITUTION OF 1787.

In his efforts to pave the way for the making of a new constitution for our federal republic, Washington drew with his own hand the outlines of three constitutions, each one of which aimed at the making of a stronger and more perfect Union. But the task was beyond his political genius. He therefore wisely contented himself with putting in motion the process of deliberation which finally resulted in the evolution of three great inventions, two of which can be attributed to individual men. The first in the order of time and importance was made by Pelatiah Webster, a man of whom we know little and of whom we should know more. He published at Philadelphia in February, 1783, "A Dissertation on the Political Union and Constitution of the thirteen United States of North America," in which he not only advocated permanent federal courts of law and equity and a stricter organization of the executive authority, but also a national assembly of two chambers instead of one, with power not only to enact laws, *but to enforce them on individuals as well as on states*. A year later that tract, which had been reprinted at Hartford, was followed by another

of the same tenor by Noah Webster, of that place, in which he proposed "a new system of government which should act, *not on the states, but directly on individuals, and vest in Congress full power to carry its laws into effect.*" This new path-breaking idea of a federal system operating directly on individuals, which became the corner stone of the new creation, swept away at one stroke the immemorial weakness that had inhered in all prior federal fabrics dependent on the requisition system enforceable only against states as states. But the new idea, great as it was, was useless without a yoke-fellow. If the new government was to act directly on individuals, it became apparent that it must be strictly organized and equipped with the machinery adequate to that end. But of such a federal government there were no examples. The Articles of Confederation had provided neither a President nor a judiciary; under its provisions all governmental functions were merged and blended in the powers of the single chamber known as the Continental Congress. To Jefferson we are indebted for the second great conception, which rendered the discovery of the Websters effective. Writing to Madison from Paris, he said, in a letter dated December 16, 1786: "To make us one nation, as to foreign concerns, and keep us distinct in domestic ones, gives the outline of the proper division of power between the general and particular governments. But to enable the federal head to exercise the powers given to best advantage, it should be organized as the particular ones, into legislative, executive and judiciary." That division of functions, characteristic of the English constitution, had reappeared in the constitutions of the several states; into that mirror Jefferson had looked for his ideals; from that source he drew the idea embodied in his fruitful suggestion. When that point was reached, when it was clearly understood how a strictly organized federal government, divided into three departments, legislative, executive, and judicial, and operating directly on the individual citizen, could be constructed, but one more step had to be taken in order to bring the new creation into full harmony with the original invention to which the typical English state in America had given birth. Turning again to the state constitutions as a nucleus of light, the builders of the second federal system seized upon the principle of constitu-

tional limitations on the legislative power and lifted it into a higher sphere by providing for a government of delegated and limited powers. As such limitations would have been entirely ineffective without a tribunal armed with the ultimate powers to construe and enforce them, the inevitable consequence of the last step was the creation of the Supreme Court of the United States—a court without a prototype in history, the first court ever entrusted with the power to pass finally upon the validity of a national law. Such was the origin of the new and far-reaching political conceptions which the master-builders worked into the unique creation that arose out of the proceedings of the epoch-making convention held at Philadelphia in 1787.

THE NEW FEDERAL CITIZENSHIP CREATED BY THE  
FOURTEENTH AMENDMENT.

Great as the new creation was, the fact must be admitted that at the outset it rested upon a solecism that survived until very recent times. As all the world knows, the new principle that became the basis of the more perfect union and imparted to it its distinctive character was that the sum of federal power vested in the new constitution should operate not on states in their corporate capacity, but directly on individuals. If that principle had been carried at the time of its adoption to its logical conclusion, it would have been settled then that the individuals upon whom the new government was to act were primarily its own citizens. That no such provision had been made was put beyond question, when, in the notable case of Dred Scott, a grand inquest was made for the purpose of discovering a primary federal citizenship, and the return had to be made *non est inventus*. In other words, the federal government of the United States, differentiated from all others of its class by the fact that it operated directly on its citizens, really had no citizens. The first section of the Fourteenth Amendment contains the first positive definition ever given of citizenship of the United States as a primary and substantive thing, independent of state citizenship. It must therefore be said that the adoption of that amendment completed the logical symmetry of the existing constitution.

#### IV.

### THE CONTEMPORARY DEVELOPMENT OF DIPLOMACY.

BY DAVID JAYNE HILL, LL.D.,\*

Professor of European Diplomacy and Treaties.

Among the great interests of modern times, none is more deserving of public attention than the transaction of international business. Every ship that discharges a cargo in a foreign port, every telegraphic message from beyond the sea, every exchange of commodities across the national frontier, imparts to the world a deeper sense of its unity and solidarity.

While private enterprise, seeking legitimate extension, is thus becoming international, public functions are passing through a significant process of development. Politically and legally, the surface of the earth is held under the sovereignty of independent governments, sometimes remote in space from the territories over which they exercise control, and all intent upon extending their power and importance. At a moment when industry and commerce have become most keenly aware of a world-wide interest, the political system is most vigorously emphasizing the power of territorial control. The situation thus created presents the most intricate diplomatic problem of our time—the reconciliation of political conceptions originating in an age of national isolation and general hostility with the rising tide of human activity which is asserting, and will never cease to assert, the rights of commercial intercourse.

#### I. THE CLASSIC CONCEPTION OF DIPLOMACY.

The fundamental doctrine of diplomacy is the absolute sovereignty of the state. Raised by this theory above all laws, each state exists for itself alone. Without distinction of gov-

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\* Now on leave of absence as Minister of the United States to Switzerland. A paper read before the International Congress of Arts and Science, at St. Louis, September 23, 1904.

ernmental forms—empires, kingdoms, and republics alike, all pretend to possess those unqualified attributes which ancient Roman theory accorded to a practically universal empire. When the great national monarchies rose out of the ruins of the ancient system, each assumed the *imperium* which Rome had formerly exercised; and subsequent constitutional transformations, while profoundly modifying the state as regarded from within, have never affected its sovereign pretensions. The existing international system, therefore, presents the contradiction of merely territorial sovereignties claiming the prerogatives of absolute power. The tardy recognition of formal equality among them has, indeed, conceded something to the order of fact; but this concession confronts us with the anomaly of actually limited and theoretically coequal political entities, all assuming to possess supreme authority.

The diplomacy based on this conception has been rendered classic by gifted writers, who draw their inspiration from these pretensions. Its patron saint is Machiavelli; its consummate apostle, Talleyrand. Its maxims, creations of eighteenth century philosophy—half imagination and half metaphysics—have been formulated by Ancillon and Count de Garden. "Whoever can do us harm, wishes, or will wish, to injure us. Whoever, by superiority of force or geographic position, can injure us is our natural enemy. Whoever is unable to harm us, but can, by the extent of his power or the advantage of his position, injure our neighbor, is our natural friend. These propositions," concludes Ancillon, "are the pivots upon which all international intercourse turns."

The forces of a state are grouped by Count de Garden under four rubrics: territorial, pecuniary, military, and federative. A nation becomes strong by extending its frontiers, augmenting its material wealth and credit, maintaining a powerful military organization, and entering into conventional arrangements with other powers for its own exclusive advantage.

All this implies that national prosperity consists in acquisition and expansion, unlimited in principle and measured only by the energies of the nation. It is egoism made public, systematic, and absolute. Self-aggrandizement being the main-

spring of national life, all our neighbors are our natural enemies; for they will take all that we do not appropriate, and when they are able will strip us of what we already possess. The only means of preserving national existence is, therefore, to appropriate so much, and to possess it so securely, that we may become irresistible.

The normal relation of human societies—according to this conception—being one of permanent hostility, material greatness is the one purpose of public action, and armed force the only safeguard of existence. In this system, the diplomatist has no other function than to exercise his personal cunning in securing the preponderance of his sovereign master. Since the destruction of competitors is an indirect method of increasing our own superiority, the aims of diplomacy—according to this school of thought—are not only to keep our own secrets, but to discover those of our neighbors; not only to form favorable relations with other powers, but to destroy those of our rivals; not only to establish our own commerce, but to undermine and defeat the commercial enterprises of others. Depth of knowledge, rectitude of principle, elevation of character, and regard for the common good may be personal adornments; but they are not indispensable to a diplomatic agent, and may even embarrass his success.

Let us admit that nations cannot exist without a primary regard for their own interests; that force is the final safeguard of justice in every form of human society, and that war may sometimes be necessary and even become a duty. But is it true, that suspicion and hostility, rather than mutual confidence and friendship, are the natural basis of international relations? Is it true, that honor, justice, and coöperation can produce a reign of prosperity and security within the boundaries of particular states, but must obstinately halt at the national frontiers and refuse to pass beyond them?

It is time to treat the classic axioms of diplomacy as economists have treated the fictions that so long separated economic philosophy from the realm of fact. The theory of the physiocrats, that a nation can be prosperous only as it develops agriculture; and the doctrine of the mercantile school, that

national prosperity consists in the accumulation of precious metals, are both now seen to be without foundation. Production is a vital process as manifold as human wants and human faculties, and wealth a state of satisfaction not capable of being measured in the terms of one commodity. Modern thought has made it plain that the deductive method has crippled and disfigured every science which it has ever attempted to organize; for no concrete being is the incarnation of a single principle, and no living thing is incapable of transformation. The law of evolution is as applicable to the forms and elements of human society as it is to the natural world. The sociology of nations presents no exception; and diplomacy needs to be brought down from the realm of false abstractions and unverified traditions, and made to grasp the full significance of the facts and forces of contemporary progress.

Since the great classic masters of diplomatic science formulated its theories, a profound transformation, half-conscious but wholly inevitable, has taken place. Public attention may accelerate this movement and public indifference may retard it, but no conceivable influence can wholly destroy its work. Since the era of absolutism—which the French Revolution interrupted and the Congress of Vienna attempted to restore—the constitutional movement has placed charters of popular rights in the hands of nearly all civilized peoples, and the work of national unification has thrown new light on the moral nature of the state. In place of chance aggregations of disparate elements, held together by arbitrary force, homogeneous nations have come into the foreground of history to work out their natural destinies. Within these states, law, order, justice, and security have come to be respected; but the crown and completion of the political system—the establishment of law, order, justice, and security between nations—still remains inchoate.

How are these great aggregations of humanity to be brought under the laws of social well-being and progress? Diplomacy must seek the answer from those historic forces and those forms of human knowledge which have modified, and still continue to modify, the conditions under which its task is to

be accomplished. In a general sense, the whole onward movement of human knowledge and culture—including the art of warfare, the means of transportation and communication by steam and electricity, the influence of the press, the diffusion of education and culture, the expansion of the horizon of public interest by trade, travel, and the prompt publicity of remote occurrences—has transformed the organization of society. But we may, in particular, better comprehend the task of modern diplomacy by considering some of its relations to history, jurisprudence, ethics, economics, and education.

## II. THE RELATION OF DIPLOMACY TO HISTORY.

"History," as De Tocqueville has remarked, "is the breviary of the diplomatist." It not only explains the nature of his functions, but it is the record of his achievements. It recalls the former existence of a vast intercontinental state—comprising parts of Asia and Africa and nearly all of civilized Europe—embracing a single faith, governed by a single code of law, and comprising nearly all that then existed of human civilization. It shows how the political unity that held in the embrace of one universal empire the Briton and the Numidian, the Spaniard and the Assyrian, and for centuries made of the Mediterranean a Roman lake, realized a state that included a great part of humanity. It explains how an organization so complete and powerful was finally overwhelmed and dismembered by a mistaken policy toward the despised barbarians who surrounded it. It reveals the psychological and moral unity of Europe in that marvelous transformation of the barbarian kingdoms into another vast empire founded on community of religious faith, the reunion of free assemblies, and the organizing capacity of Charles the Great. It proves the practical futility of the imperial conception by the whole course of subsequent events. The inevitable dismemberment of the mediæval empire into independent kingdoms, the development of feudal society as a means of local defense, the inadequacy of merely local government for the necessities of industrial and commercial growth, the rise of the great monarchies as a means of emancipation from feudal servitude, and the reconciliation of local

sovereignty and universal authority in the formation of modern states, are all consecutive links in a chain of irrefutable argument by which the diplomatist vindicates the indispensability of his science to the world.

It is an historical certainty that the permanent organization of mankind must henceforth rest on the basis of independent political communities. No one familiar with history can imagine the possibility of reëstablishing a universal empire. No thinker permeated with the historical spirit entertains a serious hope of a general federation of sovereign states. Smaller political communities may, perhaps, be gradually absorbed in the larger; but the great powers give no promise of coalescence and no indication of uniting to form a permanent confederation. These great masses of organized human energy may still modify their frontiers, but they will continue for centuries to confront one another, as fixed and enduring on the surface of the earth as the stars in the firmament.

The task of the diplomatist is, therefore, neither a vanishing nor a declining enterprise. It is one which, on the contrary, in the presence of the bristling array of terrific instruments of destruction on sea and land, assumes an ever-increasing solemnity and responsibility. The diplomatist should know the history of these great national entities, and of their relations to one another, as a competent physician would wish to know the life record of a delicate or dangerous patient, for the present—in nature and in life, individual and national—is but the epitome and expression of the past. The future knows no other guide, and it is from history that we are to gather the formulas of present action.

In view of its importance, it is astonishing that no complete history of diplomacy exists in any language. Such a history would include not only an account of the rise and progress of international intercourse, but an exposition of the motives by which it has been inspired and the results which it has accomplished. But even this statement does not fully define the scope of such an undertaking; for an intelligent comprehension of diplomacy must also include a consideration of the genesis of the entire international system, and of its progress through the

successive stages of its development. Thus regarded, it would be seen that diplomacy, taken in its largest sense and including the foreign policy of nations, possesses the deepest qualities of human interest, for the whole fabric of present international relations—embracing its laws, usages, privileges, and obligations—is the result of past diplomatic activity.

If, therefore, the diplomatist is deeply indebted to the historian, and would gladly increase this indebtedness, his guild is prepared to make a rich return in compensation. It is from his archives that the most precious and trustworthy materials of history are to be derived. It is his dispatches that explain the origin and causes of every war and the terms and conditions of every peace. It is in the correspondence and records of his government and in the details of his letters, memoirs, and reminiscences that the whole psychology of international policy must be sought.

A new type of history came into being when von Ranke in Germany and Mignet in France turned their attention to unused diplomatic sources. For fifty years past innumerable scholars have ransacked the archives of the European governments, gathering a rich harvest of data and documents relating to special questions, and thus, at last, international events, studied from many angles of observation, as from a multitude of photographs, begin to assume their just proportions. On some future day, when the scientific historian has made full use of this authentic material, a mirror will be held up to nature, in which not only the diplomatist may perceive the lessons of past negotiations, but citizens of once opposing nationalities may discern the true merits of great controversies, so easily distorted by patriotic pride and popular tradition. Every such revelation, by diminishing the rôle of passion and prejudice, will narrow the chasm which separates peoples by enabling them to discover that in their most bitter contentions there were two sides where they have been accustomed to see but one.

Passing over a multitude of instances, a single example may serve to illustrate what remains to be accomplished in the vast and fertile field of diplomatic history. Toward the close of his reign, His Holiness, the late Pope Leo XIII, opened to the

use of historical scholars the secret archives of the Vatican. Thus, for the first time, were presented to the scrutiny of the historian the records and correspondence of the most ancient international institution in the world. The reports of the papal nuncios alone fill more than four thousand volumes, divided into twenty-one groups, according to the places from which they were written. There are, besides, letters of importance covering centuries of intercourse by kings, princes, cardinals, bishops, and eminent individuals.

The labor bestowed upon this rich collection of documents has already borne precious fruits, but a vast proportion of its contents still remains to be explored. The Austrian and Prussian institutes have published a part of the reports of the nuncios emanating from Germany, but the great mass of these reports still remains untouched. The French school at Rome has published many valuable documents found in the papal archives, including the registers of several popes, and also a number of special studies, such as the scholarly works of Déprez and Pélissier, which exemplify what may yet be done for the history of diplomacy, now for the first time rendered possible in the scientific sense.

But even when made accessible in printed form, the contents of diplomatic archives have little human interest until they are placed in those relations which render them significant to the public mind. No text-book of mathematics is more dull and unattractive than a volume of treaties; yet, when we enliven its dreary text by bringing upon the scene the national interests involved, the deep human sentiments affected, the exciting drama of negotiation, the deadly struggle and ardent aspiration which its contents represent; when we follow the conflict of which this dull document forms the conclusion, and perceive in it a victory of peace and intelligence that swallows up and symbolizes the victories of war; when we see in it the triumph of a just cause, the sepulchre of a false ambition, the ruin of a hopeless system, or the consecration of a great principle, we realize that nothing serves better to mark the rising tide of human progress. But when a treaty of peace becomes a yoke of servitude imposed by force upon a prostrate people, defeated

in a just cause, we learn how infinitely far the triumphs of arms are removed from the triumphs of reason, and that the least certain path to equity is that appeal to force which adds to the misfortune of injustice the calamity of defeat.

### III. THE RELATION OF DIPLOMACY TO JURISPRUDENCE.

Trial by battle has long since been suppressed in all civilized communities as essentially barbaric and irrational; yet great nations continue to arm themselves for future conflicts, and appeal to the God of battles to crown them with victory. What is it, then, which justifies the use of armed force by the state, while the forcible avenging of private wrongs is condemned in the individual? What is it that dignifies with the honorable name of "war" the confiscation of property and the taking of human life by public determination, when these are punished as "robbery" and "homicide" if perpetrated by private persons?

Jurisprudence replies that the state is an association of human beings organized for the attainment of common ends—among them public peace, justice, and security of life and property—acting in the interests of all, not for the benefit of one or a few. Its laws are the necessary antidote for anarchy, and its authority to make and enforce them is derived from its "sovereignty."

It is precisely this conception of "sovereignty" that reveals the transformation of human thought with regard to the organization and relations of the state. In the Roman Republic it signified simply "the majesty" of the Roman people; but under the Empire it lost its connection with the constituent elements of the state, and was translated into "the will of the Emperor." In the revival of Roman law that accompanied the formation of modern states it assumed the form of absolute monarchy, and accepted the formula, "Whatever is pleasing to the prince has the force of law." In the philosophy of the revolutionary era the source of authority was sought in the people, but without losing its absolute character. The doctrine of "popular sovereignty," in its crude and unanalyzed form, suggests that whatever is pleasing to the majority has the force of law—an inference which might be used to justify

any enormity which a vicious or misguided multitude might choose to perpetrate upon the few or upon the rights of foreign peoples.

Such a conception of the state would be as false as it is inadequate, and no thoughtful and well instructed jurist would defend it. The essence and justification of the state lie in the social purpose which it seeks to accomplish, as defined in its constitution, for the bare and formless will of a people can not serve as its foundation. A state is not a chance or arbitrary association of men bent on a predatory expedition. Such a group of human beings would be called a mob rather than a commonwealth. Nor can such an aggregation of men rise to the dignity of a state by mere organization and discipline, as a band of highwaymen might be subordinated to the direction of a chief. A state is brought into being by historic conditions which unite men in a body politic for the purpose of self-regulation and the realization of common ends of order, justice, and security. The state, therefore, is a moral entity in which all private benefits are subordinated to public well being.

It is only as a moral entity—or, as it has even been called, as a "moral person"—possessed of will, intelligence, and determining principles, that a form of human society can claim the attributes of a state. Otherwise it is merely a form of force, without prerogatives, founded on juridical conceptions. What, then, is "sovereignty" if not the prerogative of a state to command its own constituents, to make and enforce laws, to guard its own being and independence from aggression, and to be recognized as a moral entity?

Such is the modern juristic conception of the state, and as such it holds its place in the family of nations. Is it, then, a moral entity when seen from within, and devoid of all relation to law and justice when regarded from without? The qualities which support and justify its claim to "sovereignty" within establish its place as a responsible agent in all its intercourse with other bodies politic. To say that the state exists solely for itself and is subject to no law or principle which it chooses to deny or disregard is to destroy at its root all civil authority whatever. The individual does not voluntarily enter the state;

he is placed in it by an act of nature. By another act of nature nations of men exist side by side, forming separate political communities. Whatever principle of natural right subordinates the subject or citizen to the legal jurisdiction of his birth coördinates coexisting sovereign states and creates between them reciprocal rights and obligations.

Before the time of Gentilis and Grotius the states of Europe had as little regard for each others' rights as rival bands of brigands; but these great jurists and their successors, appealing to the intelligence of all nations by disclosing the existence of universal principles inherent in human nature, convinced mankind that even in a state of war laws are not wholly silent.

In his great work on "The Laws of War and Peace," Grotius, appealing to the universal rights of humanity, pointed out that the state, existing for the realization of justice, must apply just principles even in its use of force. A body politic refusing to be governed by rules of justice thereby forfeits its claim to sovereignty; for in declining to perform its obligations it destroys the only logical foundation of its rights.

It is for the recognition of this universal juridical bond between all nations that international jurists have labored during the last three centuries. Natural law, the Christian religion, the jurisprudence of Rome, general custom, common consent, and conventional agreement have all been advanced as furnishing proper elements for the construction of that international code which all jurists have agreed does, or should, exist; and all these elements have afforded contributions to that great body of principles and usages which constitute the present system of international law.

Vague and undetermined as this body of jurisprudence is, no civilized nation denies its existence and its general authority. On the contrary, most nations not only recognize it, apply it, and appeal to it, but in some manner formally adopt it as a part of their own municipal law. The United States of America has not only done this, but has by constitutional provision declared that treaties with foreign powers constitute "the supreme law of the land;" and has attempted, in a digest prepared at public expense and by official direction, to define with

minute exactness the whole body of international law. Such a course, if followed by all nations, would furnish the materials for the ultimate formation of that formal international code which jurists like Bluntschli and David Dudley Field have endeavored to construct.

What, then, is necessary to establish between nations the observance of those principles of equity which are universally recognized in civilized communities? International law possesses no guarantee except the good faith of nations and of their public men, and no penalty for open violation except such as the injured party may be able to inflict. In the society of nations, there is neither legislature, nor judiciary, nor executive.

For this reason, one of the most important events of the nineteenth century was the establishment of a permanent international tribunal at The Hague. As in the case of the Supreme Court of the United States, which today regulates the most important controversies of forty-five great commonwealths, its inauguration was greeted with doubt and distrust; and, because it has not in the few years of its existence proved a preventive of wars and a touchstone of universal peace and concord, it is still, perhaps, regarded in some quarters as a mere chimera.

It is true that The Hague Tribunal at present appeals to us by its possibilities rather than by its actual achievements; but its mere existence, composed of jurists among the most distinguished in the world, is an immense gain to civilization, and can not fail to promote the pacific settlement of international disputes. It adds to the dignity of this tribunal that, by the munificence of a wise, generous, and cosmopolitan benefactor, a splendid Palace of Justice is soon to be erected for its use, in a country whose thrift, integrity, and place in history make it a fitting seat of international mediation.

But the progress of this movement is not merely theoretical and material. One of the founders of The Hague court has initiated parliamentary action that is spreading out into a network of treaties by which questions not affecting national honor and independence are henceforth to be referred to this tribunal. His Majesty the King of England has been especially

active in promoting these conventions, and their Majesties the Emperor of Germany, the King of Italy, and the King of Spain, and His Excellency the President of France have united in concluding treaties by which these great powers are setting the example to smaller states of an appeal to law and justice as the normal standards of public action.

While the age is fortunate in possessing among its rulers and public men enlightened leaders who truly represent the progress of thought and society, it would be visionary to expect that hereafter rivalry or misunderstanding may not again bring into violent collision the vast armaments which continue to increase rather than diminish. The *raison d'état* which has so often plunged nations into armed conflict still controls public policy; and, although there may be a growing disposition to respect acquired rights, there are still abundant opportunities for contention.

#### IV. THE RELATION OF DIPLOMACY TO ECONOMICS.

The most potential source of peril to public peace and international justice is, at present, the conflict of economic interests. The irresistible increase of population, the demand for territorial expansion, the development of the colonial system, and the struggle for new spheres of influence, in the quest for raw materials and foreign markets, create a situation fraught with danger.

It is to the science of economics that diplomacy must turn for the means of averting this danger. Questions of far-reaching consequence still remain unanswered. Is the political control of territory necessary to the enjoyment of its commercial advantages? Is it a profitable enterprise to divide the world into purely national markets, thereby excluding ourselves from the areas of trade held by other nations? Is it more remunerative to acquire, control, and defend colonial possessions than it would be to share their advantages with others under the protection, wherever necessary, of an international police? Is it not possible to diminish the cost of modern navies by intrusting the defense of commerce to an international marine governed by an international code?

These questions are not addressed to any particular nation, nor is it intended to answer them in any definite sense, but simply to call attention to the problems that press equally upon all, and to inquire if there is not a pacific solution of them based on the principle of general welfare.

The classic maxims of diplomacy forbid all cosmopolitan benevolence, and represent the hostility of national interests as inherent, inevitable, and permanent; but those maxims, if logically applied, would have prevented all political progress founded on the sacrifice of private interests for the public good. Every advance which the world has made in civilization has resulted from the perception that mutual advantage might be obtained by harmonizing conflicting interests. The formation of the American Union, the unification of Italy, and the consolidation of the German Empire are among the greatest achievements of modern history, and illustrate the prosperity that may be realized from mutual concession for the common good. Out of struggling colonies and rival principalities great states came into being, blessed with unexampled prosperity, because their constituent parts ceased to waste their energies in obstructing one another's welfare and joined their forces for mutual benefit.

Beneath the surface of political phenomena flows a great historical current which deserves the attention of thoughtful men. The expansive instinct of humanity changes its direction of action according to the obstacles it has to overcome. In the era of political inequality, the general aspiration was for liberty, which created in the eighteenth century a struggle for national independence; but in the constitutional era that followed, the larger human relations were revealed, and in the nineteenth century was developed the idea that modern nations are essentially interdependent. The special task of the twentieth century will be to reconcile these two great conceptions, and to unite independent states in bonds of peace, amity, and fruitful intercourse.

This, in the broadest sense, is a task of diplomacy; but it is also a problem of economics, and its most vital energies will be derived from economic considerations. At present the cost

of national armaments has reached an overwhelming height, and raises the practical questions, How long will the wealth-producing population continue in silence to support this burden? and how long will the wealth-possessing population confide in the ability of governments to meet their financial obligations?

Diplomacy would be untrue to its high vocation if it did not direct public attention to this costly guardianship of peace. It is true that it is not for aggressive warfare and inconsiderate bloodshed that these millions are expended, and that so long as great nations continue to arm themselves, others must do likewise in self-defense; but the day is coming when humanity, feeling its kinship of suffering more keenly than its hereditary fears, will cry out in universal protest against a system which does violence to its better instincts. No process of thought or of negotiation will be too costly if it can open the door of exit from the condition of mutual distrust that arrays great nations against one another in constant apprehension of hostile intentions. Next to national honor, which need never be sacrificed, the one great interest of mankind is peace.

#### V. THE RELATION OF DIPLOMACY TO ETHICS.

But there is a deeper spring of human action than the desire for material welfare, and the costly sacrifices of war are its best witness. We must not in the name of economic selfishness, nor even of mistaken moral sentiment, condemn the measures needful for national defense. A morbid idealism has proclaimed the dogma that no war is just, that bloodshed is never right, and that all exercise of force is wrong. Such a doctrine owes its very possibility to the protection of institutions that would not exist for a single day if society had not the force and determination to destroy its enemies. There is no idea of "right" except in opposition to that of "wrong"; and because existence itself is an equilibrium of energies, force is the necessary basis of society. It is in the awful heat of battle that the State has triumphed over anarchy and Justice established a throne upon the earth. In a world of mingled good and evil, there can be no perpetual peace. Of this no one is more fully conscious than the diplomatist,

whose negotiations would degenerate into empty words if they were not supported by a material force capable of vindicating disregarded rights. But certainly the measure of force is in no sense the measure of international rights and obligations, which exist independently of military strength. The little states have the same right to existence, and to respect, as the great powers; for, as moral entities, all civilized nations, pursuing a common end, have an equal claim to ethical consideration.

It will be a great advance in education when our text-books on ethics devote their concluding chapter to international morality; for no ethical system can be complete, either in a public or a scientific sense, which does not include in the scope of its theory the moral functions of the state and the ethics of international intercourse. When, in the schools of all civilized countries, the young are taught that moral obligation does not end with national frontiers, that states are moral entities subject to the great principles of ethics, and that treaties once freely accepted are sacred; when national history has learned to be fair and honest in its representation of other nations, a new era of human development will be opened and diplomacy will enter upon a new period of efficiency.

The national conscience of every people can not fail to be touched by the mere recital of the decalogue which will be written in that new Book of Genesis:—

I am the God of truth and righteousness, and thou shalt have no other gods before me;

Thou shalt not steal;

Thou shalt do no murder;

Thou shalt not covet thy neighbor's industries, nor his foreign commerce, nor his colonial possessions, nor anything that is thy neighbor's;

Thou shalt honor thy wise men and thy teachers of righteousness, that thy name may be long in the land which the Lord thy God giveth thee.

Who will venture to complete that august code of public duty? Who, bravest of all, will dare to apply it in practice? Yet who will be so bold as to deny its application to the affairs of nations?

Diplomacy already reveals the influence of that growth in public morality which is characteristic of our time. The day has passed away forever when intelligent men would accept Sir Henry Wotton's definition of an ambassador as "a clever man sent abroad to lie for his country." Permanent diplomatic success can not be based on falsehood, and the highest attribute of a statesman is to discern just and enduring relations and build his policy upon them. A venerable and experienced ambassador once confessed to the writer that he had for months deceived himself and seriously misled his government by assuming that a certain minister of foreign affairs meant the opposite of what he said. Afterward, with shame and humiliation, he was obliged to confess his error.

#### VI. THE RELATION OF DIPLOMACY TO EDUCATION.

The advance made since the middle of the last century in the principles and methods of diplomacy are chiefly owing to two causes, both of which are educational. The first of these is the better preparation of men for the work of establishing just and reasonable international relations. In nearly all the countries of the world, except the United States of America, candidates for the diplomatic service are rigorously examined before they are received, not only in international law and history, but in the laws, languages, and constitutions of other countries, and especially in commercial geography and the statistics of foreign trade. The result is that the men who serve modern governments as diplomatic representatives are coming to have, in general, a knowledge of what is true, what is just, what is expedient, and what is right in the relations and conduct of foreign states. They constitute a valuable body of peacemakers and public advisers, whose counsel is useful because it is based on knowledge.

The second cause is the enlightenment of public opinion by means of travel, the press, and the increased interest in foreign trade. Even where the people do not participate in affairs of state, they are beginning to regard with a new solicitude the part their governments are taking in the great field of international politics. Statesmen and diplomatists are, therefore,

working in the presence of a public interest more keen and intelligent than has ever before been awakened in questions of foreign policy.

To train men for the diplomatic service, and to create and guide public opinion in the right way, through the knowledge and influence of properly qualified journalists, legislators, and other public officers, special schools—like the *Ecole Libre des Sciences Politiques* at Paris—have been established in several countries, in which international subjects are receiving increased attention, but no educational enterprise of a truly international character has yet been undertaken.

Here is a vast, fruitful, and wholly uncultivated field for public benefaction. One can imagine a time when teachers and students of different nationalities will meet at a common center, or pass from country to country, to examine and discuss, in a scientific spirit, questions which concern the general welfare. If it is true that at the heart of every controversy there is a right unsatisfied, it is equally true that for every right intelligence can devise a mode of satisfaction. It is not by force, or the menace of force, that human differences are finally to be adjusted; it is by the calm verdict of unruffled reason, pursuing an honest path to an honest end.

Intelligent patriotism is as sensitive to national honor as it is solicitous for national success, and good men everywhere wish for nothing so ardently as to be understood. The sword has had its day of glory; great states have come into being; public order has fought its way to the seat of power, and, from the elevation of the throne and the parliament, men may at last reason together in tones that are audible. True patriots will everywhere feel a new thrill of pride and confidence in their rulers and leaders when they behold in them the triumph of great principles of reason and conscience, for these are the elements that dignify our human nature, lifting it above the passions of the moment and connecting it with the permanent interests of mankind.

V.

SCIENCE AND ECONOMICS.\*

BY CARROLL D. WRIGHT, LL.D.,

Professor of Statistics and Social Economics.

In science we find the dynamics of political economy, as well as many other branches of human knowledge and human speculation. That eminent prelate and statesman, James Cardinal Gibbons, at the dedication of McMahon Hall of Philosophy at the Catholic University of America, a few years ago, said that many were of the opinion that the mother church did not welcome the results of scientific research—that there might be something to be feared relative to theology and religion in such research—but he asserted emphatically that the church welcomed all science and all revelations of science as new revelations of religion. His eminence recognized and appreciated the great changes in thought which had come over the world of intelligence during the last thirty or forty years, and that nothing could be revealed by science that did not reveal the hand of the great first cause; that science was God's instrument in teaching His handiwork to the human race.

The conflicts of science and religion, about which we heard so much a generation ago, have no place now in the thought of those who see in science such handiwork. We no longer look upon the earth as the spasmodic creation of a few days. Genesis becomes grand and beautiful poetry in place of alleged history. We see in it the traditions of primitive man in his attempt to account for creation. We see the economic development and evolution that brought into existence, through the slow steps necessary to produce it, what we recognize as the earth; and we appreciate more and more that this is to the greater glory of the first great cause than that formerly assumed method, the result of a literal reading of Genesis.

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\*An address by Carroll D. Wright, retiring President of the American Association for the Advancement of Science, Philadelphia, December 28, 1904. Dr. Wright, who has given regular courses in social economics in this University since 1899, assumes his duties as President of Clark College, Worcester, Mass., on the first of January.

Science is no longer a menace to religion. It has, to be sure, overturned dogmas, upset superstitions, and changed the theological thought of the world, but it has left with us the evidence of that divine economy in creation which is so essential in considering the works of the Almighty; and as the result of increased knowledge which science has brought us the human race is happier, and more generally recognizes that all things must grow slowly, steadily, surely, to that stage of perfection which must mark the works of the Supreme Architect.

If this has been the result in the realms of theology, so long ruled by dogma and artificial tenets, science must have had some influence in shaping those matters which belong to the every-day life of man, his business relations, and his social environment. For the present hour I am to consider what this influence has been in overturning, modifying, and extending the theories of economists, and see whether political economy owes anything to science, or what science must and can do in reshaping and extending the great laws of the business world.

First, we must consider that peculiar and interesting doctrine known as Malthusianism. The doctrines set forth by Malthus comprehended more than his celebrated theory relative to the encroachments of population upon the food supply. These supplemental doctrines involved what is popularly known as the iron law of wages, the wages fund, and the law of diminishing returns, all of which have by scientific thought and investigation given way in large degree to theories more rational and more in line with the facts.

Concretely, Malthus announced the theory that population increased in a geometrical and food in an arithmetical ratio; but after the announcement he contented himself with a more general proposition, that population, unless checked by war, poverty, and other calamities, tended to increase faster than sustenance. Malthus was supported by other writers. There is, of course, something in this doctrine relative to the pressure of population upon the food supply which must be admitted as containing some truth, and at the time Malthus wrote it was supposed to contain the truth. The author of the theory, however, did not anticipate and could not foresee the great changes which would come in the way of the cultivation of the land and

in other ways to increase the food supply relative to the increase of population.

The time may come, to be sure, when the Malthusian theory will be revived ; but it is not in our day, nor will it be in our century, for scientific thought almost completely overturned the theory, and has relieved it of its strength in exciting the fears of economists or of philosophers that the world was gradually but surely coming to that position where it could not supply its population with food, and that some method of checking population must be the resort. The broadening of the area of supply through discovery and the taking up of vast tracts of land were the immediate means of depriving the doctrine of its force ; but later on intensive agriculture and the discoveries of science succeeded in relegating the theory to the past. It is perfectly evident that science has accomplished more in reducing the theory to the minimum than all other forces combined ; for transportation and telegraphy, by which famines are avoided or minimized, by which prices are equalized, by which the markets of the world are known every day, are the direct result of scientific discovery and of the application of the laws of nature.

Of course, Malthus depended upon the dogma of the older economists, that labor is the basis of all values—a doctrine which constituted the ground-rock on which Marx and his associates builded their socialistic structure. Science is steadily, and rapidly, too, ridding the world of this doctrine, for, in connection with the Malthusian theory, it shows that labor, while the origin of values, is not and cannot be the sole basis of all values.

In the light of present-day conditions there is little place for either the theory of the pressure of population upon the food supply or the theory that labor is the basis of all values. We are now having a wheat crop of nearly 800,000,000 bushels, a corn crop of nearly 3,000,000,000 bushels, an oat crop of close upon 1,000,000,000 bushels, and other crops in proportion. This is for our own country alone, and it gives us the privilege of feeding the world and of relieving it of the fears of starvation or of the conditions of abject poverty ; these are conditions which now affect few and exceptional cases and not the masses.

Closely allied to the doctrine of the pressure of population

upon the food supply is the law of diminishing returns—a law which holds now in all works on political economy. Science has not destroyed the law, but has modified it. It is fundamental and all-embracing, but is usually applied to the agricultural industry, although it extends in its principles to all industries, as that law of physics that increased speed is at the expense of power applies to all mechanical contrivances; and yet the law of diminishing returns, through scientific discovery and investigation, has been so far modified as to invalidate largely its relation to the Malthusian theory of population.

Volumes might be written relating to the influence that machinery has exerted in this respect—machines whose construction results in processes that parallel the work of the human brain and the human hand. Modern science shows that such machinery does not have the effect outlined by Doctor Smith in his story of the pin machine. To these machines we apply steam, compressed air, water, electricity. All the great forces of nature are brought into play, and through the ingenious contrivances of man supply the forces by which the law of diminishing returns is modified. In all directions this influence is observed; in a thousand directions we see the doing away with the rule of thumb and the application of distinct, positive scientific principles. The factory itself is a scientific structure, involving the highest mathematical skill. Through these things and the application of new principles in agriculture, science overcomes the influence of the seasons by preserving products, by equalizing prices, and by all the other means by which the world is brought into closer contact, one nation or people with another.

The latest discoveries are, of course, the most effective in modifying the law. A gentleman in one of the eastern States has about seven acres under glass. He raises cucumbers, lettuce, and other things for the winter markets. A few years ago he found that all the plants on the northern side of his houses grew slowly, lacking that development attained by the plants on the southern side. He alternated by transplanting. Still he found the plants on the northern side developed slowly and unsatisfactorily. Of course, he attributed this to the lack of sunlight on the northern side. When he had about given up

the idea of securing any evenness in the growth of his plants the town inaugurated a system of electric lighting, and established along the northern side of his houses several powerful lamps. He then found that the plants on that side of his houses did as well as those on the southern side, the result being that he introduced electric lights in his houses, so that his plants should have the benefit of such lights all during the night. The effect of this was that his cucumbers, for instance, grew more rapidly, with more even development, and with a higher grade of tenderness. He sells about ten thousand cucumbers every winter at twenty cents apiece. This discovery was not new with him, for about that time scientific investigators in Italy and some other parts of Europe were experimenting in the use of electric light to perfect the growth of vegetables.

Afterwards my friend made another discovery, not new to the world but new to him, and that was that by sterilizing the soil he could stimulate the growth of plants to maturity, secure freedom from the growth of weeds and the influence of germs in the soil, and anticipate the market. This he did by putting gangs of steam pipes in the soil about a foot deep, thus absolutely cooking the soil, killing all poisonous germs and all seeds of weed plants, while insects indigenous to the soil and injurious to the growth of vegetables entirely disappeared. He insists that the soil of any farm, conditions being favorable, can be sterilized in the same way, and at small cost, thus rewarding the farmer by relieving him of much labor now necessary in the cultivation of all kinds of plants and vegetables. Such experimentation must, of course, modify the law of diminishing returns to such a degree as, for a while at least, to rob it of its peculiar influence in increasing cost or retarding the supply from the cultivation of certain kinds of land; but, as I have said, the law remains as a law.

In mechanical productions science has also done much toward modifying the theory, although, of course, there is a limit to the power of machinery and to the employment of people that will always preserve the principle involved in the law; but in these directions—in the Malthusian theory of the pressure of population and its accompanying theory of the law of diminishing returns—science has done much to modify the tenets of the older economists.

The next matter in close relation to the Malthusian theory, and one which has yielded largely to scientific research and the application of scientific principles, is the iron law of wages—that law which provided that the workingman should and could receive only that amount of wage which was essential to life merely, just enough to keep body and soul together and to keep the human machine properly lubricated for its daily work. This law was fortified and reinforced by the wage-fund theory. Overcoming the one meant the modification or the complete abrogation of the other. The wage-fund theory did not originate with Malthus. It was suggested by Adam Smith himself and was developed by his followers, but by the power of modern scientific analysis it is given up today, so far as its original form is concerned, by all economists, although many of them assert, with some reason, that it contains valuable truth and, when properly stated, the whole truth.

As originally stated, the law is that wages, like everything else, are governed by supply and demand and in the aggregate depend upon the proportion of laborers to the capital available for employing labor, this capital being denominated a wage fund. Doctor Smith said, in his "Wealth of Nations," that the demand for those who live by wages, it is evident, cannot increase but in proportion to the increase of the funds which are destined for the payment of wages. Malthus and Ricardo held to this doctrine, but argued that wages could not rise, even by increasing the wage fund, because if the wage fund were increased and wages were temporarily raised, population, according to Malthus, always pressing on the limits of subsistence, would be enabled to expand and the increase in the number of laborers would increase the supply relatively to the wage fund, and therefore lower wages. Ricardo held substantially this doctrine, as also did Senior, James Mill, John Stuart Mill, and most of the older writers of the classical school, though on this subject, as on others, John Stuart Mill later somewhat modified his views, and was, perhaps, often inconsistent.

As a result of more scientific consideration, this theory was practically abrogated and a new one arose, which, in brief, is the theory that production furnishes the true measure of wages. Curiously enough this theory was first clearly advocated in our

own country and by the late President Francis A. Walker when he argued that the wage-fund theory and its socialistic corollary were wholly false; that wages depended upon the productivity of labor, and not upon capital. He says, in his work on the wages question, that the popular theory of wages is based upon the assumption that wages are paid out of capital, the saved results of the industry of the past. Hence it is argued that capital must furnish the measure of wages. Walker held, on the contrary, that wages are, in a philosophical view of the subject, paid out of the product of present industry, and hence that production furnishes the true measure of wages, the employer purchasing labor with a view to the product of labor, and the kind and amount of that product determining what wages he can afford to pay.

This view has been very widely accepted, both here and abroad, Mr. Atkinson accepting and urging that the only way to raise wages is to raise the product; and, applying his power of analysis, he says that in treating this question it must constantly be kept in mind that money is but the instrument of exchange, that real wages are what the money will buy, and that there cannot be more real wages than the whole product less the share of capital. If, then, we can even approximate the value of the product and divide by the known number of persons employed, we then approximate the annual measure or average rate of wages in terms of money. In other words, to state it briefly, he says that capital must be paid first in order to induce it to contribute, but it is paid only just what is necessary in the market to obtain it, and the rest of the product goes to wages.

The formula of Adam Smith, indorsed and advocated by his followers, is now revised and should read, instead of as quoted, as follows: "The demand for those who live by wages, it is evident, cannot increase but in proportion to the increase of product which is destined for the payment of wages." There have been many laws promulgated relating to wages, but I think that the scientific attitude of the present-day economists rests upon this theory, and it must stand until science restates it, and re-states it in such a way that all or the majority of all economists will accept the formula. Certainly we must claim,

and truthfully, that science has either abrogated or very largely modified the old theories relating to wages.

Another line of inquiry suggested by my topic relates to the ever-present, irritating, and much-controverted questions in regard to a tariff on imports. As yet science has done but little in this respect, but I conceive that it may and will do much in modifying the extreme views on either side that are held by economists, politicians, and statesmen. It may be granted that tariff legislation relates entirely to the question of expediency; that there is little, if any, principle involved in the doctrines of either free trade or protection. That is the present attitude of men, but the power of science is disturbing the older thought and the older doctrines on this great subject, for it is equalizing conditions everywhere—a process which goes on constantly and which will help to show legislators the true path to be pursued.

In my own view the tariff question is more sociological than economic. Until the conditions of the different peoples that are engaged in competing industries are more thoroughly equalized, probably both the great political parties in our country, acting together, could not get rid of some form of a protective tariff; but when, through scientific methods and the application of scientific principles to industry on a broad scale, the conditions of the people become more thoroughly equalized, I doubt if both parties together will be able to preserve legislation relative to an expediency now felt to be important. A scientific basis of tariff legislation is sure to be advocated, and when it comes it will be the entering wedge to simplifying the commercial and industrial relations of different peoples. As already intimated, the uniformizing of prices, the expansion of transportation, and all the other instrumentalities for reducing the size of the world, from an industrial point of view, are affecting and will affect more generally legislation relative to imports and exports.

Scientific economics will lead the economists to depart somewhat from their older methods of treating the business affairs of the world. We have chapter after chapter, repeated in book after book, on the tantalizing questions of rent, interest, etc. Science can do but little towards avoiding the waste pages devoted to these subjects; they will remain, but they are chiefly

the subject of discussion as to definition. As President Hadley has stated, political economy is very largely a conflict over definitions. This is harmless, but does little, if any, good. It is gratifying to see that the later works on political economy are making great steps in advance, are treating world-wide questions of present-day interest. They are recognizing the necessity of applying economic principles to the problems which vex us here and now, and that fine-spun theories as to matters having no interest or value as the days go by must give place to advanced treatment of the real, great questions which constitute the elements of industrial society at the present time.

Some of these questions which science will insist upon being treated will include the utilization of waste products. It is only scientific knowledge that can lead to this new development of values. A saved product is one of the necessities of industry at the present time. This utilization has taken place during the last few years, and it has upset some of the old theories as to cost and the returns of capital. By-products of all kinds are usually the source of profit, and in some cases the chief source of profit, to the manufacturer. This enables him to put out his units of original production at a less cost and with benefit to the community. Nothing is lost which through scientific methods can be preserved. Many, many instances of this will come to the minds of all; but as one superlative illustration I may refer to the by-products of petroleum, which are absolutely entirely saved through the practical application of scientific processes. It would be difficult to enumerate the products of petroleum saved by the chemical processes of refinement. The Census Office has published a most enlightened bulletin on this very subject of waste products. This utilization of such products interferes with the full force of diminishing returns, modifying the law as progressing conditions demand.

Strange as it may seem, the influence of science upon the chapters relating to finance has been marked and positive. Prof. Charles E. Munroe of The George Washington University has recently\* pointed out how technical chemistry invades the domains of economics, politics, and diplomacy, and he cites as a striking example of its effects in economics the settlement of

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\* The George Washington University BULLETIN, October, 1904, p. 46.

the silver question. The far-reaching influence of chemistry in this particular line is easily understood when we consider the relations of the metals and how those relations have been changed by the application of the principles of chemistry.

A further economic influence is to be found, as Doctor Munroe states, in the reference of a multitude of railroad administrative problems to the chemist, in the steady increase of his force of skilled assistants, and in the fact that his position in the organization has become second to none in importance. This is seen in the use of lamps, beacons, colors, and all the paraphernalia necessary for the conduct of great railway lines.

Economists have not yet adequately dealt with the great projects of modern times in relation to their influence upon economic development and the conditions of the people at large. Science will compel this treatment, and when our able and astute writers take it up we shall find illuminating chapters in the works on the ever-attractive department of political economy. The great engineering enterprises, relating not only to transportation, but to various other channels of industrial activity, must result in such treatment; but in transportation alone engineering science has revolutionized many economic conditions. Standing on the highest point of the Brooklyn bridge, there are only three things to be seen—the sky above, the water below, and the vast creations of man filling the field of vision everywhere else. It is the application in every direction of the laws of nature, utilized by the power of science, that presents this scene to the human eye.

The constant effort of science to overcome natural laws as well as to apply them must be recognized. A few years ago, at a meeting in New York, a gentleman was deploring the fact that we did not allow nature's law to have full play; that we were constantly antagonizing nature at the expense of the welfare of the human race. Mr. Abram Hewitt answered this pernicious doctrine by saying that if nature had been allowed to take its course grass would still be growing in Broadway.

The sociological results of this conflict are too vast for present treatment. They can only be suggested. Congested cities are being relieved of their congestion, and the great suburban population, the finest in the world, is recruited from the con-

gested districts and from the country. Through sanitary discoveries and through many other elements which are the direct result of scientific processes, we are reducing the power of disease and delaying the time when one ceases to exist. Rapid transportation and the great lines of transportation are facilitating the accomplishment of these wonderful and desirable results. They are reducing the possibilities of war by increasing its severity. They are making the products of one clime familiar to all climes. They are diffusing intelligence and making all people acquainted. Political economy has a vaster field in massing the facts which pertain to this broad branch of its grand science than it has as yet occupied.

Growing out of this will come a saner and more rational treatment of the power of machinery in its effect upon the employment of the people. The facts already show that in this country particularly the percentage of the whole population employed in gainful occupations constantly rises. The older economists did not have the facts. They had to draw their conclusions from exceedingly limited observation; but with the data covering the whole people the old views are overturned, and we now recognize, as the result of statistical inquiry, that not only does the percentage of the total number of people employed increase, but that the development is along the lines of the most skilled labor and in the higher pursuits of life; that the great body of people constituting the base of the industrial pyramid is constantly being narrowed and to the benefit of the whole. Scientific inquiry in these directions, added to that concerning the great engineering processes, must lead to but one, and that a scientific, conclusion.

Scientific political economy must deal with the question of alimentation, which is important in all treatment of the labor question, and is one of the most vital subjects to attract present-day thinkers. The physiological chemist is claiming attention, and rightly. He is trying to ascertain just what foods are most important, not only from a physiological point of view, but economically, and as relating to the efficiency of labor. Professor Marshall has lately made an appeal for a larger number of sympathetic students who have studied working-class problems in a scientific spirit; under this spirit this question of food and the

efficiency of labor as depending upon the quality of food must be one of the problems. What is the amount of nutrients contained in different food materials? The relative expense of different kinds of food? The ratio of relative costs of protein, fats, and carbo-hydrates, as well as the relative proportion of these elements? These facts are being ascertained, and it is necessary to know them and the influence of each upon the muscular as well as the mental capacity and development of the individual.

The economy of food must be treated from two standpoints—the physiological and the pecuniary. These elements cannot be separated if we are to understand fully the effects of different foods upon the efficiency of labor and the capacity of labor to sustain itself. These things should form a part of political economy. They are certainly far more valuable than any treatise upon rent or interest. Much has been done, but more must be accomplished. Governments, both state and federal, as well as municipal, are becoming interested in these subjects, our own federal government for some years having carried on investigations relative to nutrition. The Carnegie Institution of Washington has taken up this subject with most friendly interest, and under its direction some of the wisest and most skillful experts of the country are conducting their experiments. The federal laboratories are auxiliaries to this inquiry, and I feel sure that with the united efforts of governments, of scientific institutions, and of professors in colleges and universities there will be produced a body of facts that will clearly and definitely decide the great question of efficiency of labor, so far as food is concerned.

Going back some years, you will remember that Lord Brassey, when contracting for the labor of men of different nationalities in the construction of railroads, found by actual experience the effect produced by different kinds and qualities of food; that when the food of the Italian laborer was changed from macaroni and other things belonging to his national diet to roast beef and those things which make the British workman so superior, his efficiency was increased *pro tanto*.

It is difficult, through any statistical method or through any method depending entirely upon observation, to treat the labor question in all its elements in a way to secure beneficial results.

so far as knowledge is concerned. The statistics of wages have undergone a very decided evolution through the application of scientific methods suggested by economists. It can be learned easily—and has been stated—how many men are required permanently to perform the services of a larger number of men employed temporarily. The efficiency of labor relates specifically to this subject. For instance, it was ascertained a few years ago that in a number of establishments producing pig iron 310 different employees were required to carry on the works, but that if the workmen had been employed continuously only 71 would have been necessary; that the average earnings of the 310 individual employees were \$169, while the consequent average earnings per employee if the work had been continuous for the 71 men would have been \$734 per year. A scientific economic analysis of such conditions would probably show a variance necessary to a true economic conclusion; but political economy has not yet attacked such problems with the same force with which it has dealt with other and less important matters.

The treatment of the labor question must, if there are great results to be secured, be brought under the same scientific methods that are applied in other directions; and there are various other statistical elements which, for the intelligence of all people, both employers and employed, require the application of scientific analysis, for I take it that the relations of employer and employee will not be as fully harmonized as may be desired until such application is made. The employer does not understand fully the conditions of his own work; the employee certainly does not understand the conditions of production. All these conditions are the result of scientific development, and that development, in order to secure the very best results in establishing a rational basis for treatment, must have further elucidation before great results can be expected.

As another instance, the volume of products at different periods, as shown by values, is the prolific source of most pernicious doctrines. Our official statisticians have been wrestling with this subject for many years, and some advance has been made, especially during the last national census. I refer particularly to the duplication of values. We say that the product of the mechanical and manufacturing establishments of the

United States is, in round numbers, over \$13,000,000,000, but this amount represents the value of raw material and labor, each producer returning the full value of his product, which may become the raw material of other manufacturers all along the line. The deduction of the value of the raw material from the total value of the products, of course, simplifies the problem, but it does not scientifically solve it. Scientific methods must be resorted to, and if the political economists, in connection with their allies, the statisticians, will undertake this problem, greater progress will be made. So far hints only are to be found in the books. These hints, of course, are familiar to all statisticians, but the difficulty of securing the true product without exhausting the treasury is one of great complexity.

So in the whole field of sociology—involving crime, charity, benevolence, and all that pertains to the efforts of society to remedy existing evils—we need a new method of treatment. There is such a thing as scientific charity, which is immediately concerned with the economic welfare of the people. The great questions of insurance—how to remedy or provide for the economic insecurity which belongs to the present wage system, the compensation of working men for accidents, and everything of the kind—must be the subject of treatment by political economists. They will need all the science of the actuary, all the skill of the statistician, and all their own power of analysis.

You may ask what can be done in these respects. The official statistician, who, as I have said, is the ally of the political economist, and who recognizes the scope and the necessity of all that is taught in orthodox political economy, also recognizes the need of the further application of economic analysis in the use of the data he collects. He cannot study these questions except from the statistical point of view. His duty is to collect, classify, and publish facts relating to the conditions of the people. Their economic interpretation must be, and largely too, the work of another class.

Professor Simon Newcomb, in a tentative way, has made some suggestions along these lines. These suggestions have been submitted to the Carnegie Institution of Washington, with the hope that that institution may effectively promote not only research in the exact sciences, but the analysis of data that are

now in existence. He says that the nineteenth century industriously piled up a vast mass of sociological observations and data, as well as data relating to other branches of science, and that this accumulation is going on without end at great expense in every civilized country. This proposition we all admit. The problem of working out the best results from these observations, however, is one which is not being effectively grappled with, the consequence being that what has been done toward obtaining results consists largely in piecemeal efforts of individuals, frequently leading to no well-established conclusions. He asserts that another feature of the situation is the gradual extension of the principles of exact science into the sociological field; that it is through this extension, rather than through adding to the already accumulated mass of facts, that progress is most to be hoped for in the future.

He therefore suggests that a body of men be employed, organized into a bureau of exact sciences in general, whose work shall be the development of mathematical methods and their application to the great mass of existing observations. He understands well, of course, the difficulty of securing just the right men who can take up in a sociological way—although his suggestions embody many other branches—the exact scientific analysis and interpretation of facts in existence.

Evidence comes from other sources. Dr. Karl Pearson, of University College, London, in commenting upon Doctor Newcomb's suggestion, states that a man of mediocre ability can observe and collect facts, but that it takes the exceptional man of great logical power and control of method to draw legitimate conclusions from them. He thinks that at least 50 per cent of the observations made and the data collected are worthless, and that no man, however able, could deduce any result at all from them; that, in the language of engineers, we need to "scrap" about 50 per cent of the products of nineteenth-century science; that the scientific journals teem with papers which are of no real value at all, recording observations that cannot be of service to any one, because they have not been undertaken with a due regard to the safeguards which a man takes who makes observations with a view of testing a theory of his own; that in other cases the collector or observer is hopelessly ignorant of

the conditions under which alone accurate work can be done ; that such a man piles up observations and data because he sees other men doing it and because that is supposed to be scientific research.

Professor Pearson feels that sociological observations are of the lowest grade of value in too many cases ; that even where the observers have begun to realize that exact science is creeping into the sociological field they have not understood that a thorough training in the new methods is an essential preliminary for effective work, even for the collection of material ; that these observers have rushed to measure or count any living form they could hit on without having planned *ab initio* the conceptions and ideas that their observations were intended to illustrate.

Doctor Pearson is skeptical about the right men or the right man, and he thinks the securing of these men is the chief difficulty in organizing any force for the scientific interpretation of the great mass of data now existing. But he says that when the right man is found he must have been rightly trained ; that he is to be occupied in drawing logical conclusions from other persons' observations and data ; that therefore he must, in the first place, be an adept in scientific method, a first-class mathematician and statistician, and a trained calculator and computer. Such a man will be the man who has the courage to "scrap," and to do it relentlessly. Science wants immensely the courageous pruner, but Doctor Pearson feels that such a task is not an enviable one.

Such a work is also indorsed by Lord Rayleigh, of the Royal Institution of Great Britain, and Doctor H. H. Turner, of the University Observatory at Oxford, in sympathizing with Doctor Newcomb's suggestion, does not hesitate to say that no one will be found to doubt the necessity of a far more extended discussion of results ; that in the days of Newton, perhaps, observations were scarcer than theories, and it was advisable to set them going, but that now there is no doubt whatever that there is a crying necessity that we should organize the discussion of the masses of accumulated material.

Dr. S. H. Darwin is also in sympathy with such work, while in this country Doctor Fisher, of Yale ; Doctor Pickering, of

Harvard, and others are agreed that we must utilize the vast collections of data and the results of observation in a more scientific way in order that the conditions of the people in all sociological aspects shall be more clearly defined.

All these suggestions are stimulated by what is known as the new political economy. Personally, I do not particularly like that expression, but I do like the phrase "social economics," because, while political economy deals with the accumulation, distribution, and exchange of wealth—fields perfectly legitimate—and sociology is the science of the relations of individuals and institutions, social economics deals with relations in industrial society. Hence it comprehends in a broad sense all that is comprehended by political economy, as well as those other elements of present-day economics which relate to other passions than the passion of wealth. We must agree, however, with Buckle, that "wealth must accumulate before knowledge can begin," and its corollary, that "great ignorance is the fruit of great poverty." We must also recognize Whewell's utterance, that in all cases the arts are prior to the related science. Art is the parent, not the progeny, of science. The wants of the world have developed science. The old alchemists in their work preceded chemical science. So the empirical investigations and researches to discover remedial agencies have bequeathed to the world great stores of knowledge now systematized.

We must also recognize that during the past one hundred and twenty-five years or so political economy, as a separate branch of philosophy, has sprung into existence. The age has been conducive to its development, for it has been one of material progress. Economics has ruled almost at the expense of ethics, notwithstanding during the same period the world has been constructing great charitable and educational institutions, emphasizing its desire to benefit the human race. These institutions, however, have fallen far short of their true purpose. Much of the charity of the world—unscientific, unreasonable—has resulted in more densely populating penal institutions. The scientific investigations of the present time are remedying this fault; and are showing that economics and such institutions must be considered together.

All the strides civilization has made command our admiration, and its onward steps are marked by numerous and convincing evidences; but such evidences are outside the science of political economy, and are considered by it only as the cost may enter into the distribution of wealth it seeks to create, but not as means for a happier and better condition wherein wealth could be more successfully produced.

Under the spur of this progress, political economy has flourished, first, by the patronage and through the admiration of all classes. England did not give it birth, perhaps, but cared for it through its infancy and gave to the world the more matured growth which we call political economy; but England's writers claim that she owes her industrial position in the past to it. It may be that to a too blind following of later teachings she owes today the partial loss of her old industrial supremacy. America, if she desires to occupy the place England is vacating, must take lessons of her mother and profit by her mistakes, and advance her scientific understanding to economic truths and principles.

The old school has been content to teach the laws that regulate the production, distribution, and exchange of wealth, and these laws have in large measure, and wholly until more recent years, constituted the science of political economy. It has studiously avoided all other matters, and in the endeavors of its devotees to constitute it a science has taken no cognizance of the conditions which, favorable or unfavorable, must attend the participators in the production, distribution, and exchange of commodities. It has been content to limit itself to things and their relations to individual and national wealth, more particularly the latter, rather than to include in its sphere of creed the vital relations of men. Even Mr. Mill, perhaps the most brilliant writer of his age, informed us that "political economy is concerned with man solely as a being who desires to possess wealth and who is capable of judging of the comparative efficacy of means to that end. It makes entire abstraction of every other human passion or motive, except those which may be regarded as perpetually antagonizing principles to the desire of wealth, namely, aversion to labor and desire of the present enjoyment of costly indulgences. \* \* \* Political economy

considers mankind as occupied solely in acquiring and consuming wealth." This statement was made in 1844.

Prof. John K. Ingram, in 1879, called this a vicious abstraction, which meets us on the very threshold of political economy, and the strictures of our own Professor Walker upon this saying are too well known to be quoted here.

Mr. Mill's statement represents the tenets of the old school, although the founder of the science, Adam Smith, began his labors in it as a professor of moral philosophy, and taught it as a branch of that philosophy. His followers, in their ambition, for many years strayed far from the doctrines of their great master, and with their departure from him political economy lost the sympathy and even the attention of the wage-workers of English and American communities—the very support it largely needs and should have.

It is most gratifying to know that our modern economists are recognizing the weakness of the old doctrines. They are recognizing the necessity of more scientific treatment, of an analysis of conditions, of an interpretation of facts and observations in considering the great wants of the present day. Political economy, like theology and religion, must change with the thought of the age; it must change as industrial and social conditions change; it must seek to ally itself with all the great sciences in every line of work, and to reach conclusions that shall be of vital importance to the working masses of the world. It is a happy sign, as already intimated, that the newer works on political economy are recognizing these things and are extending the field of their discussions. Here is the great hope, and herein lies the importance of the relation of science to political economy. Science is always ready, when the results of its investigations warrant it, to wipe off the slate of yesterday and turn its face to the light. Political economy has not always done this, but it should be as ready as science has been to follow new revelations and announce new truths.

VI.

RELIGION AND PERSONALITY.\*

BY EDWARD B. POLLARD, PHD., D.D.,

Formerly Professor of Biblical Literature.

"Look out for a people entirely devoid of religion," said Hume, "and if you find them at all, be assured they are but a few degrees removed from the brutes." But the truth is, such people are not found. Some races, like marble, are capable of much polish; others, like granite, possess a high resistance to crushing; yet others, like sandstone, are readily shaped by external agencies. Some races are intellectual, some emotional, some progressive, and some conservative; but all are religious.

Religions are many, as there are "gods many and lords many." But beneath all religions lies religion. It is not an incident nor an accident; it is not the invention of priestcraft nor of policy, but the very outgoing of human nature itself. Religion is the most persistent and universal fact of human life.

It is impossible to deal with elements more vital than those brought before us in the subject assigned me; for religion is universal and imperishable, and personality is the fundamental fact of all existence; it is the ultimate reality.

The leading types of religion have already been discussed before this Congress. The varieties and the *vagaries* of religion do not fall in our purview. I am told that certain persons have facetiously dubbed Professor James's stimulating and informing volume upon "Varieties of Religious Experience" with the title "Wild Religions I Have Known." In dealing with the influence of religion upon personal life it is not the extraordinary and exceptional, but the general and universal features of the religion that will claim our attention.

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\*Delivered in Festival Hall, before the Religious Section of the International Congress of Arts and Science, at St. Louis, September 25, 1904.

In primitive conditions of community life an irreligious man did not exist. As Robertson Smith says in his *Religion of the Semites*, "Individual men were more or less religious, as men now are more or less patriotic, but there was no such thing as an absolutely irreligious man." This may be said of primitive peoples generally. Religion was largely a matter of tribal import rather than of personal life and individual choice. After a while, however, the individual emerges; partially, at least, disengaging himself from the society of which he was a particle. Now he becomes truly conscious of himself, of his individual powers and privileges. God is his own God, and religious obligations and practices become at length individualized. New responsibilities are born to him, and from Deity he can not flee, though he "take the wings of the morning."

Whether religion be viewed subjectively, as thoughts concerning the spirit world, or objectively, as the practices and organizations that have grown out of the religious sense—that is, whether as creed or as cult—its influence upon personal life has been incalculable. Mr. Benjamin Kidd in his *Social Evolution* finds religion to be the central feature in the development of human society. With yet greater force may it be claimed that religion has been the most influential factor in the development of the individual life. The problem of society must always be the problem of the individual.

First allow me to say that religion is the great unifying and harmonizing force in the personal life.

Speaking teleologically, it is the business of religion to bring a man *en rapport* with Deity. Religion, as "the life of God in the soul of man," removes the individual from what would otherwise be an isolated and self-centered life into one which is Deo-centric. The spirit world and the spirit life become to him intense realities. God becomes the common denominator in all his relations. Religion can never be adequately conceived of as a single department of human interest. It is the underlying and unifying fact in all the departments of life. The lowest savage eats, dresses, hunts, kindles his fire, marries his wife, wages his wars—does everything in the name of his god; and one of the most enlightened of religious teachers enjoins

"whether ye eat or drink or whatsoever ye do, *do all* to the glory of God." Here we have from widely separated sources a recognition of the fundamental and unifying fact of religion. It is in man's God-consciousness alone that he can find the ultimate harmonizing of all his thoughts, powers, and strivings. Atheism and irreligion can furnish no rational basis for the fundamental unity of things.

"Though truths in manhood darkly join  
Deep-seated in our mystic frame,  
We yield all blessings to the name  
Of Him who made them current coin."

Religion has always involved the belief in a certain solidarity of God with His worshipers. It makes no difference whether this sense of solidarity arose from the belief in blood kinship between the god and his people or in more ethical conceptions, religion always implies the bringing of God and man into proper relations with each other.

It is in this belief that there is an unseen one with which man has to do and to whom he is accountable that the *sense of obligation*, so important in shaping human life and conduct, is both begotten and kept alive. A sense of responsibility forever steadies man. He has about him a constant observer, or observers, to whom he must give account. The force of this statement is felt when one remembers that in the lower forms of religious development no obligation was felt which lay outside the realm presided over by the god or gods to whom the worshiper owed allegiance. When every deity had his own land, a crossing of the boundary line took one from the sphere of obligation. Even in mediæval times the heathen and the infidel had no rights which the zealous, but misguided, Christian needed to respect. It is only as God is recognized as one and his kingdom as ruling over all, that universal obligation is felt in the human breast. Take this religious sense of obligation away from the world and the earth is peopled with Ishmaelites and Philistines.

Religion in bringing man *en rapport* with deity, *ipso facto* brings about between himself and nature a relationship pecu-

liarly true and vital. In the last analysis, it is man's religious nature which enables him to interpret nature outside of himself in terms of his own life, for underneath all phenomena he recognizes a common source with his own. Such interpretations have at times been exceedingly crass. The savage believes in the personhood of everything about him. In the fetich is a spirit, of which the stick or stone is but the outward representative; trees and mountains, the running brooks, and starry heavens are peopled with unseen spirits not unlike his own. What Tylor named animism—that is, the belief that everything is somebody—is but the rude effort of the untutored mind at feeling after the religious truth that behind all phenomena there is spirit, that all move and have their being in God.

It is in the religious consciousness that man first recognizes the mysterious kinship between himself and nature. The North American Indian believing in his kinship with his tribal totem, and communing with a kin-divinity through the sacrifice of a kindred animal, is expressing in his crude way the same deep-seated truth set forth by the Christian apostle to the Gentiles: "For the earnest expectation of the creature waiteth for the revealing of the sons of God: . . . that the creation itself also shall be delivered from the bondage of corruption into the liberty of the children of God." Man and nature are discovered to be one in origin, and in a certain sense one in end and destiny. So to the religious spirit all nature speaks of God. "The heavens declare his glory and the firmament sheweth his handiwork." All things about us speak of the bowed knee:

"The clouds like hooded friars  
Tell their beads in drops of rain."

Through religious promptings the little cosmos of man's own soul has responded to the greater cosmos of the wide, wide world. Thus it comes about that religion is ancestress of the sciences. Chemistry springs from alchemy, the child of early religion; astronomy from astrology; pharmacy and the healing art from sorcery. Religion, standing before the mysteries of nature with an inquiring heart, opened the way for all knowl-

edge of nature. So far, then, from there being an antagonism between the true religious spirit and the true scientific spirit, these are identical. It is the attitude of responsiveness, of obedience, the willingness that the message nature brings may speak what it wishes. Religion without inquiry has lost the primal religious spirit, and science without belief in the unity of things is without a rational basis; and while religionists have sometimes persecuted the spirit of inquiry as hostile to that of faith, and scientists have ridiculed religionists as hostile to the spirit of investigation, it still remains true that the uniform and irresistible influence of religion has been upon the side of the advancement of human knowledge. It says, with one of the richest religious spirits of the age :

"Let knowledge grow from more to more,  
But more of reverence in us dwell,  
That mind and soul, according well,  
May make one music as before,

"But vaster. We are fools and slight  
We mock thee when we do not fear,  
Help thy foolish ones to bear,  
Help thy vain worlds to bear thy light."

Religion has also done more than all other agencies to disclose man's proper relation to his fellow-men. The sense of the dignity and importance of man, his significance as an immortal being, the sense of obligation toward him as man—all this has been the fruitage of religion, more especially of the Christian religion, which, it may be said, was first in discovering the individual in the deepest and richest sense, as of infinite value in himself, as the religious unit, as deserving and demanding to be free. Christianity achieved this, however, not by discovering a new religious principle, but by universalizing and unfolding that which was in germ in the religious nature first implanted in the human soul. From the lowest forms of blood brotherhood through a totem, or a kindred animal, up to the very highest conceptions of brotherly love as taught by Jesus and his Apostles, religion has kept alive the sense of man's responsibility to man. The application of this principle has often been exceedingly narrow; malice and bloodshed have

been born of religious devotion, and yet this only proves the truth of the claim, for brotherhood and obligation always ceased where the sense of religious solidarity ended. A man was a brother if he worshiped the same God, and he was therefore his brother's keeper. Fearful punishment followed a violation of this law. When religious development reveals the one God and Lord of all, the sense of universal brotherhood, through a universal paternity, was sure to follow. So at length love is recognized as the law of spiritual gravitation which regulates the universe of spirit. D. G. Brinton in *The Religious Sentiment* has strongly set forth the place of love in religion, affirming that love is the emotion above all others which "reveals the character of the religious sentiment." If this be the conclusion of a scientific study of religion—a truth with which every student of Christianity is perfectly familiar—then religion must have the credit of giving to man the fundamental working principle of personal life—a love which not only "worketh no ill to his neighbor" and "seeketh not its own," but which gives its very life for the world, revealing that the immortality of life is the immortality of love.

It is love that has given the world all that is best, truest, sweetest in human life and character. It is love that has stimulated the loftiest purposes and dictated the noblest achievements. It is love alone that has made life worth the living and brought ebbing hopes into being again.

And so religion has cared for the helpless and broken, buried the dead, built schools and asylums. It has elevated womanhood, as men have recognized that "the eternal womanly leads us on," advancing man from the sterner virtues of courage, strength, and endurance to the tenderer graces of humility, self-surrender, mercy, love.

All this means that religion has been the prime factor in enabling man to find his true place in the universe, so that God, man, and nature work out their perfect harmony.

This leads to the statement that religion has been the great energizing and enriching agency in the development of the personal character. "Religion," said Bacon, "is the spice which is meant to keep life from corruption." But it is more than an

aseptic and moral sterilizer. It has energized and fertilized the will of man, elevated his sentiments, and enkindled his intellectual life.

What has religion done for the human will? Many, with Kant, would find the seat of religion here, in a "categorical imperative" which speaks the final "thou must." We shall not undertake to show how much cannot be accounted for upon this theory of religion. That the will is powerfully concerned all will admit. In those features of the religious life summed up in cult and in conduct the will is potent. Indeed, here we stumble upon the anomaly that the excessive ritualist and the preacher of an ethical culture, at the very opposite poles in spirit and in practice, are at one in their root idea, namely, that religion is largely a performance of the will, manifesting itself, therefore, objectively, the one in ceremonies, the other in moral conduct.

Some religions, conspicuously Buddhism, have suppressed and enervated the will by exaggerating the doctrine of self-effacement and teaching the utter loss of self as the highest blessedness. But this is exceptional." Even the very idea of self-abnegation has been a powerful educator of the will, enabling men without flinching to give themselves for their religious ideals and count it joy! Certainly it is true that, as with every step of religion toward purer and more rational ideals, the more elevated it has grown, the purer the conduct has become, the saner the cult.

Once holiness was but a name for a ceremonial condition. In the development of the religious ideals holiness at length comes to mean *wholeness*, symmetry of character, purity of soul, to have an intensely ethical meaning. A perpetual problem of religion has been to disclose and to maintain morality in its rightful place in human life. Aside from the underlying principles of religion, morality has no fundamental justification. It is religion alone that speaks of an ideal standard and can furnish a rational ground for obligation in moral conduct.

Consider the value to personal life of some of the most universal expressions of the religious consciousness, such as the rites of purification, sacrifice, and prayer.

Some form of purification is almost as widespread as religion itself. From the lower ideals of bodily cleanliness to the higher spiritual conception, such as that of the Hebrew poet when he exclaimed :

"Who shall ascend unto the hill of the Lord,  
Or who shall stand in his holy place?  
He that hath clean hands and a pure heart,  
He that hath not lifted up his soul to vanity  
Nor sworn deceitfully."

this determination to have fellowship with God has made quick the conscience of men, fostered the sense of sin and the need of being reconciled to the Infinite One. The value of this prompting to personal life and conduct has been incalculable.

Some form of sacrifice is coextensive with religion itself. The sense of obligation to Deity, of gratitude for past blessings, of desire for present fellowship and future happiness, have thus been led out to their own best meaning ; by it the springs of generosity and unselfishness have been opened. Take the sacrificial idea out of human life and human history and the world would be poor indeed. Without it, the best in mother-love, in patriotic devotion, as well as in religious achievement is stricken down. This idea finds widest and best expression in the familiar words "God so loved the world that he gave his only begotten Son, that whosoever believeth in him should not perish, but have everlasting life." That is, self-giving in a world of sin and suffering is divine. Man's response to divine love is religion.

So, too, the value of the prayer-life, which, in some form, is characteristic of all religion, has made for unmeasured enrichment, for it has been keeping man's soul sensitive to the voice of the Infinite in myriad modulations about him, and man at length discovers with the Mariner :

"He prayeth best who loveth best  
All things, both great and small ;  
For the dear God who loveth us,  
He made and loveth all."

Religion, energizing the will, has made men stronger to dare and to do. No cause has so long a list of real martyrs. It has

made men undertake and achieve the impossible, to hurl themselves against adamant only to see it crumble before them. What gave to the Crusaders, misguided though they were, their superhuman endurance? The belief "God wills it!" Cromwell and his Ironsides made the armies of Charles melt before them. The one party cried, "God with us!" The other had only the tocsin, "Ho! for the Cavaliers!" and the Royalists went down before the Roundheads. England dominates India, and the West dictates the policies of the East, because the more vital the religion, the more potent will be the will of the worshiper. The God motive is the most potential of all incentives. Let the human will be once thoroughly dedicated to the Divine, and at once you have a force that must be reckoned with. Every Hannibal who devotes himself at the altar will make Rome tremble. Man's will, no less his own than before, becomes God's; and this is the goal of religion, as the great laureate says:

"Our wills are ours, we know not how;  
Our wills are ours to make them Thine."

This at once suggests the influence of religion upon the motives—upon the emotional nature of man. Among primitive peoples a religious motive seems to be present in almost all their doings. Some have found the seat of religion in the emotions. Long ago the Latin poet-philosopher held that "fear makes the gods." Schliermacher finds religion's origin in the feeling of dependence. Mill makes religion "emotions and desires toward an ideal object." Huxley calls it "reverence and love for an ethical ideal." That we find in these statements, and in all others that find the rise of religion in the emotional life, important truth can not be questioned. It is because of this truth that religion has played so important a part in the shaping of human sentiments. There is deep seated in man the longing for divine fellowship, the desire for communion with a power not ourselves. In the presence of this power man "takes off his shoes." Aristotle held that all education may be summed up in teaching men *how to fear rightly*. Take away from human life the feeling of reverence for the

sacred, awe for the sublime and the all-powerful, the sense of human dependence, the feeling of need for divine fellowship, and you have cut the nerve of all that has proved best and richest in human character and achievement. There has been a tendency to undervalue the emotional life and to crown Reason as king of the human powers. A rebellion has broken out, both among the psychologists and the theologians, that the emotions may enter into their rightful heritage. While religion is more than fear, or wonder, or dependence—more than any one desire or emotion—yet all these, so common to religion, have made greatly for the enrichment of life. Without the emotional nature, religion could not exist, and without religion there can be no emotional life worth the having.

Take the single fact of wonder, or what the author of "*Revealed Religion*" calls "habitual and permanent admiration," which he gives as a definition of religion, at least in its elementary state. By keeping alive the sense of wonder, religion has greatly contributed to human life. The savage stands puzzled before the moving leaf; the little child gazes at the twinkling stars and wonders what they are so high above him; and the man of science cannot banish this awe-inspiring admiration; for with every advance of knowledge wonder gives place to a widening circle of mystery. This has ever led the untutored to better things and allured the man of science to newer conquests.

There are certain ideals which religion has always fostered without which human life would be flat and arid. Religion is normative. The soul of man has from the earliest times been haunted by intimations or inspired by belief in an ideal life.

There are no more universal facts in the history of religion than faith in human perfectibility and the belief in personal immortality. To say that these two ideals have inspired human life, elevated and energized their undertakings, is to pronounce a truism. These two, coupled with the doctrine of the perfection of human society, may be termed cardinal beliefs, so general and radical are they. Leave the idea of immortality out of life, whether it move on the low plane of the Amerind, who would take his earthly trappings to the spirit world, or on the

higher plane of Him who "brought life and immortality to life in the gospel;" leave the desire for and striving after the perfect out of human emotions, and human undertakings languish. It is this ideal that has ever beckoned man onward and upward; it is because of this we find:

"Progress man's distinctive mark alone,  
Not God's, not beasts'. He is; they are;  
Man partly is and wholly hopes to be."

Religion is optimistic. In so far as it is pessimistic it is irreligion. Even Buddhism looks forward in hope, though that hope be in the loss of personality. Religion looks forward to a Golden Age before as well as a Golden Age behind—a restored humanity, a redeemed society. Surely "we are saved by hope."

This reaching after perfection has its correlative feeling in the sense of divine sonship on the one hand and the widespread belief in a divine incarnation on the other. In all religions a certain sense of sonship is present—crude and narrow in primitive clan life; present in the patriarchal system of the Chinese; present in Plato's divine man who should bring order out of human conflicts; and best of all in the revelation of Jesus, whose preëminent emotion was the feeling of filial relation with God.

Without the aspirations for immortality and perfection which religion enkindles, personal life must ever move upon a low plane of hopelessness, helplessness, and blight.

The contribution of religion to the esthetic nature need only to be mentioned to be recognized. Imagination, twin sister to faith, imagination enkindled by religious motives, has given us all that is best in art. From the rude but rhythmic motion of the religious dance, all through the higher development of the drama, of architecture, painting, sculpture, up to the highest forms of poetry and eloquence and music in all the stages of development, art owes its origin, its patronage, and its power to the religious motive. This is because religion has always touched the deepest and truest emotions of the heart.

As has already been intimated, religion has been foremost in stimulating the intellectual pursuits of men, fostering inquiry, being a patron of learning. Religion is in fact the progenitor

of the sciences. The rich religious nature of many of the world's greatest scientists, statesmen, philosophers, educators—thinkers in all branches of intellectual pursuits—is a testimony to religion's contribution to the enrichment of personal life. From Copernicus and Tycho Brahe to Silliman, Agassiz, and Le Conte; Newton, Faraday, Dalton, Davy, the Herschels, Maury, Clerk-Maxwell, Pascal, Priestley, Joseph Henry, and a great host of others bear this testimony.

It is truly an encouraging sign of the coming unification of all knowledge that the scientists like James Starbuck and Stanley Hall, as well as the theologians, are carefully studying the facts of religious experience and giving them their rightful and indisputable place. A harmonizing of the facts of nature outside of man and nature within him can come only through patient and sympathetic study of all the facts, for

"Truth is one  
And in all laws beneath the sun  
Whoso hath eyes to see may see  
The tokens of its unity."

That which the religious consciousness has known from the beginning is being disclosed by every advance of science and philosophy; namely, the essential unity of all things. The religionist is recognizing in the scientist a friend and co-worker; and the scientist would do well to remember that it is the attitude of reverence, of submission, of obedience, as Bacon, the father of the modern scientific research, well pointed out, that unlocks nature's secrets to the human mind.

We need all three of the galleries seen in the palace in Wilhelm Meister—reverence for things that are beneath us, reverence for things that are about us, and reverence for things that are above us—if we are to possess the universe of Truth.

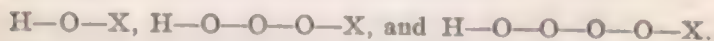
"When I found him in the bosom,  
Then I found him everywhere,—  
In the bud and in the blossom,  
In the earth and in the air;  
And he spake to me with clearness  
Thro' the silent stars that say,  
As ye find him in the nearness  
Ye shall find him far away."

## VII.

THE CONSTITUTION OF CERTAIN HALOGEN  
OXYACIDS AS INFERRED FROM THERMO-  
CHEMICAL DATA.\*BY EDWIN A. HILL, PH.D.,  
Instructor in Chemistry.

The constitution of the halogen oxyacids, though frequently under discussion, is still unsettled, and the thesis has for its object an attack upon this problem along new lines, to wit, those of thermochemistry, it being assumed throughout that in these acids oxygen is bivalent, and that there is no direct union between hydrogen and the halogens.

The acids considered are of the general types  $HXO$ ,  $HXO_2$ , and  $HXO_3$  ( $X=Cl, Br, \text{ or } I$ ), where one of the earliest theories, now pretty well discarded on purely chemical grounds, was that the halogen valence is 1 and the structural formulas are, respectively,



The "heats of formation" of these acids in dilute aqueous solution as determined by Thomsen† (T), and Berthelot‡ (B), using Thomsen's thermal notation, may be written as follows for the chlorine acids:

Reaction IV....( $Cl, O, H, Aq$ ) =	3935° (B)	3935° (B)	3935° (B)
Difference.....	15410	16850	16130
Reaction III...( $Cl, O, H, Aq$ ) =	23940 (T)	22500 (B)	23220‡
Difference.....	-5990	-7430	-6710
Reaction I....( $Cl, O, H, Aq$ ) =	29930 (T)	29930 (T)	29930 (T)

starting in each case with gaseous elements.

\*Abstract of a thesis submitted March 9, 1903, to the Faculty of Columbian University, in part satisfaction of its requirements for the degree of Doctor of Philosophy, by Edwin Allston Hill, A. B., M. A., Yale; M. S., Columbian.

†Thermochemische Untersuchungen, II, 399, 400, and Muir El. of Therm. Chem. 1877-1880.

‡Ann. Chim. Phys. (5), 10, 379 et seq.; Compt. Rend., 93, 244, and Muir, 249.

Meas. of Thomsen and Berthelot.

It is assumed first that there is action between the component atoms, only as indicated by the bonds in the given structural formula under consideration; so that, for example, in the acid  $\text{H}-\text{O}-\text{O}-\text{O}-\text{Cl}$ , the Cl atom has no action on H and acts only on one of the O atoms.

Now the thermal value of any of these reactions may be regarded as the sum of various components. Thus in IV the 39350 calories is the sum of the thermal values, first, of reducing the three gaseous elements to the condition of atoms in solution ready for combination (to form either ions or molecules according to whether or not we believe dissociation to exist), and, second, of the various atomic combinations indicated by the bonds.

Since the argument deals with the differences of these reactions and not with the reactions themselves, it is immaterial whether our analysis is in the terms of the dissociation or any other hypothesis, the final result will be the same as shown in detail in the thesis.

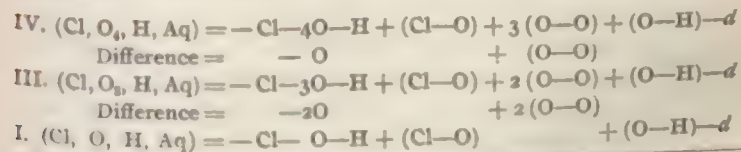
The following notation is adopted:

Let  $-\text{O}$ ,  $-\text{Cl}$ , and  $-\text{H}$ , represent the value (thermal) of dissolving the molugrams of the given elements (gaseous) in much water and bringing them into condition to combine as indicated; \*

Let  $+(\text{O}-\text{Cl})$ ,  $+(\text{O}-\text{H})$  and  $+(\text{O}-\text{O})$  represent the thermal values of the combinations indicated when taking place in dilute aqueous solution; \*

Let  $-d$  represent the thermal value of dissociating the final product into ions, if the dissociation theory holds (if not, then of course  $d=0$ );

Then evidently, using Thomsen's notation, we have as follows:



\* It is evidently immaterial in this discussion whether we use + or - signs.

the ratio of the differences as required by the theory being 1 : 2, both being of the same algebraic sign.

But the ratio of differences as obtained from the determinations of both Thomsen and Berthelot is about 3 : 1, and they are not of the same, but of opposite, algebraic signs.

The theory of a constant halogen valence of one is therefore discredited, thermochemically.

Perbromic acid,  $\text{HBrO}_4$ , has not yet been prepared, and the same is true of the acid,  $\text{HIO}_4$ , so that the argument can not be strengthened by similar tables of the acids of the halogens, other than chlorine, and no determinations are available for chlorous acid,  $\text{HClO}_2$ , so that the table can not be strengthened by the addition of either that acid or its salts.

The foregoing argument assumes that the formula  $\text{H}-\text{O}-\text{O}-\text{O}-\text{Cl}$  indicates that H acts only on one atom—that is, the O atom to which it is bonded as shown in the formula—and so likewise as to Cl and the other O atoms. This constitutional formula either stands for this or else for the idea that the bonds indicate the chief or dominating actions, and that any secondary actions, as between H and Cl, for instance, if such exist, are less powerful and have only a minor influence on the thermal value of the final result.

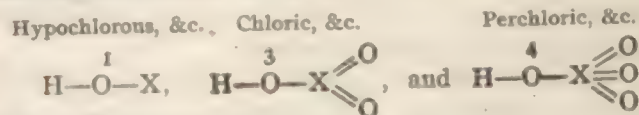
Assuming, however, that such secondary actions do exist, they can not, if taken into account, greatly affect the difference ratio or change the algebraic signs of either of these differences for the following reasons :

Compare, for instance,  $\text{H}-\overset{1}{\text{O}}-\text{Cl}$ ,  $\text{H}-\text{O}-\overset{3}{\text{O}}-\text{O}-\text{Cl}$ , and  $\text{H}-\text{O}-\overset{4}{\text{O}}-\text{O}-\text{O}-\text{Cl}$ . We have already considered all the actions represented by the bonds. Now, if in each formula there is an additional action,  $\text{Cl}-\text{H}$ , it will be approximately of the same order of magnitude in each formation reaction 1, 3, and 4, and will therefore to a large extent cancel out by subtraction when differences of reactions are taken, so that any remainder in these differences could not be of sufficient magnitude to change the sign of the differences as already found.

And similar reasoning applies to all possible interatomic actions not represented by the bonds which stand for the dom-

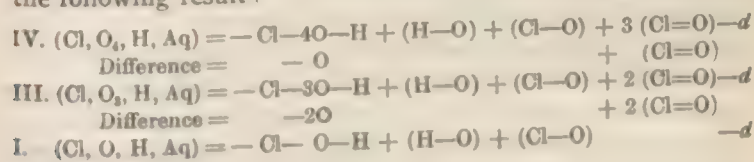
inant actions, so to speak, the secondary actions being subordinate in both quantity and quality.

A second theory of valence, quite widely accepted at present, makes the halogen valences to be 1, 5, and 7, giving us the following structural formulas :



See, for example, Roscoe and Schorlemmer's Treatise on Chemistry, vol. 1 (ed. 1894), p. 328.

Using the same analysis and notation as before, we arrive at the following result :



the ratio, as before, being 1 : 2.

Hence this theory of valence is likewise discredited, and as the Cl valence in reaction III, as has been previously shown, can be neither 1 nor 5, it is most probably 3.

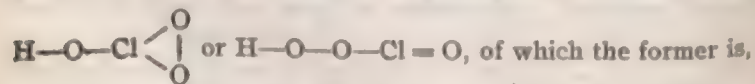
We have thus far compared, thermally, the reactions of formation in solution of various types of acids of the *same halogen*. We will now in like manner compare various halogen acids of the same type as in the table below, assuming the halogen valence to be 1 and 3 :

Number.	Reaction.	X = Cl	Diff.	X = Br	Diff.	X = I	Valence of halogen.	Number of halogens.	Product of valence by number of halogens.
1	3 (X <sub>2</sub> , O, Aq) .....	- 25470	23100	- 48570			1	6	6
	Diff. ....	205750		205750			1	6	6
2	6 (X, O, H, Aq) .....	172890	23100	156480					
	Diff. ....	205750		205750					
3	(X <sub>2</sub> , O, Aq) .....	26480	23040	- 43820	86760	- 43240	3	2	6
	Diff. ....	68260		68260		68260	3	2	6
4	2 (X, O, H, Aq) .....	17880	23040	24340	86760	- 123820			
	Diff. ....	123760		123760		123760	5	2	6
5	2 (X, O <sub>2</sub> , K, Aq) .....	171640	23040	148600	86760	235420			

Reactions 1 and 2 are for hypochlorous and hypobromous acids, 3 and 4 for chloric bromic and iodic acids, and 5 for potassium chlorate, bromate, and iodate. The determinations are by Thomsen (see Muir, Elements of Thermo-Chemistry, pp. 207, 208, and 209), and are for gaseous H, O, and Cl, liquid Br, and solid I; that is, for the natural state of the various elements at the temperature of reaction.

The constant differences, both vertical and horizontal, prove that we are here dealing with additive properties in dilute aqueous solution, and the vertical differences in the table being constant and the product of the number of halogen atoms into the assumed halogen valence being also constant, the inference appears justifiable that the theory of a valence of 3 for X in the acids  $\text{HXO}_3$ , to which we have been already led by the principle of exclusion in the previous comparison of acids of various types of the same halogen, is sustained by this comparison of the same type of acid of various halogens; for it is very evident that the constant difference of about 23040 calories between the Cl and Br columns does not depend alone on the number of halogen atoms involved, this number being three times as great in reactions 1 and 2 as in reactions 3, 4, and 5; but that if we give to the difference between the Cl and Br bond, the thermal value (for gram atoms) of 3840 calories, then the constant difference 23040, or  $6 \times 3840$ , stands for the constant thermal difference between 6 Cl and 6 Br gram atom bonds when formed in dilute aqueous solution from gaseous Cl and liquid Br, for it is evident that this equality of difference must depend upon some corresponding equality in the difference between the fundamental components of the two reactions, which can hardly be other than the product of halogen valence into the number of gram atoms of halogen.


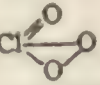
Now, the formula  $\text{H}-\text{O}-\text{Cl}$  is probably correct for hypochlorous acid; and for  $\text{HClO}_3$ , assuming the halogen valence to be 3, we may have as constitutional formulas either



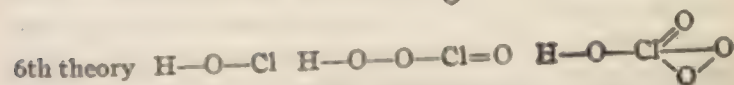
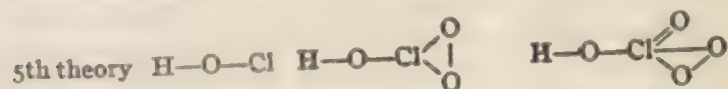
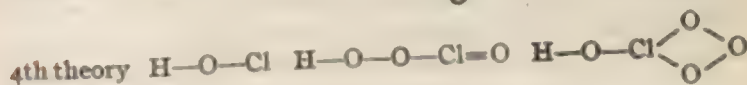
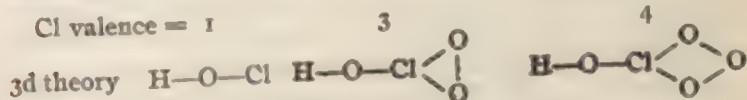
*per se*, the most probable form and has been the most widely

adopted, although it is not at present in as high favor as the formula  $\text{H}-\text{O}-\text{Cl}=\text{O}$ , which has been already shown to be

discredited by the existing thermal data. Hence, for  $\text{HClO}_4$ , we naturally infer an halogen valence of either 3 or 5 with either

$\text{H}-\text{O}-\text{Cl}$   or  $\text{H}-\text{O}-\text{Cl}$   as the corresponding structural formulas, whence we have the following possible combinations:

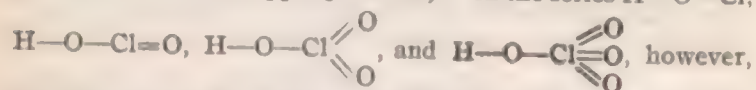
Cl valence = 1



In none of these theoretical combinations, however, can definite difference ratios be established by the foregoing methods, so that no selection can be made between them by the previous methods of analysis.

Some conjectures as to which of these formulas are to be preferred may, however, be based upon purely chemical grounds. There appears, for example, to be a progressive increase in the stability of the chlorine acids as the number of oxygen atoms is increased; but the addition of one oxygen atom to  $\text{HClO}$ , to form  $\text{HClO}_2$ , produces a much more profound change in chemical character than does the addition of two such atoms to  $\text{HClO}$  to form  $\text{HClO}_3$ , so that this increased stability is more than proportional to the number of added O atoms. This is particularly shown by the far greater stability of  $\text{HClO}_3$ , and its compounds as compared with the acids  $\text{HClO}$  and  $\text{HClO}_2$ .

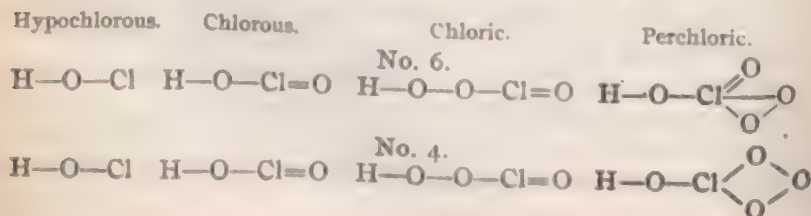
and theirs. Hence we ought to expect some marked difference in structure differentiating  $\text{HClO}_4$  from the other oxyacids, as has, indeed, been pointed out by Tilden (Chemical Philosophy, ed. 1901, pp. 156 to 160). In the series  $\text{H}-\text{O}-\text{Cl}$ ,



already discredited by the thermal argument, we do not find any such distinction of structure, which tends to confirm our previous rejection; neither do we find it in the other discredited series, in which a Cl valence of one was assumed throughout.

Of the four remaining hypotheses already referred to, the corresponding series, Nos. 6 and 4, seem objectionable because they appear to lack in structure this progressive quality indicated by chemical character. Thus in each series the first term is  $\text{H}-\text{O}-\text{Cl}$ , and the second is  $\text{H}-\text{O}-\text{Cl}=\text{O}$ , which is naturally formed from the first term by a change of the Cl valence, the O atom being added to the trivalent Cl. The third term, however, is the form  $\text{H}-\text{O}-\text{O}-\text{Cl}=\text{O}$  in both cases, the change from  $\text{HClO}_3$  to  $\text{HClO}_4$ , not being a progressive or additive change merely, due only to a difference in the valence or linkage of the Cl atom, but being a marked change in structure caused by inserting an O atom between O and H in the chain  $\text{H}-\text{O}-\text{Cl}=\text{O}$ . We also have the pertinent objection advanced by Roscoe and Schorlemmer, loc. cit., "that substances containing oxygen atoms united in this manner become more unstable as the number of oxygen atoms increases, whilst with the oxyacids of chlorine the contrary is the case."

But when we finally come to the two forms demanded by these theories for perchloric acid,  $\text{HClO}_4$ , we then have these series, viz:



Here we see that the O atom, abnormally inserted in chlorous to give us chloric acid, drops out of its place again when perchloric acid is formed. We should hence (if structural difference causes difference in properties) look for some special properties in chloric acid differentiating it from the others, *because of its being the only form in which the H and Cl atoms are separated by two O atoms*; or if we consider only the Cl aqueous ion, then the distinction would be more marked, because the valence end of the ion is at that O atom which before dissociation was linked to H.



Now, in chloric acid this ionic oxygen would be *indirectly* linked by another O atom to the ClO<sub>2</sub> group, whereas in all the other forms the ionic oxygen would be *directly* linked, and it would seem as if this difference would be accompanied by some corresponding chemical or physical difference, whereas it is HClO<sub>4</sub> that is preëminently distinguished from the other bodies and not HClO<sub>3</sub>.

Moreover, in a progressive change, as from HClO to HClO<sub>2</sub>, HClO<sub>3</sub>, and HClO<sub>4</sub>, it is more likely that the successive changes, all alike, occur on the exterior of the molecule rather than that one alone of them should by exception occur within the molecule and be in the nature of a breaking up and rearrangement of, rather than of an addition to, the preceding molecular complex.

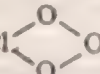
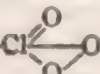
It would therefore seem far more likely that the atomic aggregate H—O—Cl once formed in hypochlorous acid remains unchanged in HClO<sub>2</sub>, HClO<sub>3</sub>, and HClO<sub>4</sub>, the structural changes being made on what may be termed the other side of the Cl atom—that is, on the side opposite to the OH group—by changes in the Cl valence and corresponding changes of the atomic arrangement on the side opposite the hydroxyl group.

Which, then, of the two remaining theories indicated by the formulas of series 3 and 5, both of which fulfill this requirement—that the progressive change shall be structurally represented by additions to the molecule on the side opposite the hydroxyl—is on the whole to be preferred on merely chemical grounds?


So far as the first three terms are concerned—that is, HClO, HClO<sub>2</sub>, and HClO<sub>3</sub>—we ought to look for but little difference

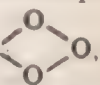
in the stability of the forms  $\text{H}-\text{O}-\text{Cl}$ ,  $\text{H}-\text{O}-\text{Cl}=\text{O}$ , as is indeed found to be the case; but the form  $\text{H}-\text{O}-\text{Cl}$   should be more stable, because of the presence of a ring formation  $\text{Cl}$  , since ring formation almost invariably tends toward

greater stability. Now, this increased stability can, I think, be observed in the chlorates and bromates as compared with the chlorites, hypochlorites, &c., and, finally, as between the two

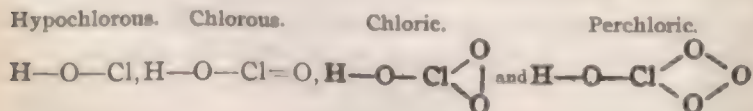
forms,  $\text{H}-\text{O}-\text{Cl}$   and  $\text{H}-\text{O}-\text{Cl}$  , the former

would seem to me to be the more stable of the two if ring formation is to count, as would be expected, for stability; and, on the whole, it would seem more natural to assume as our regular progression, which follows naturally as the heat and other conditions of formation are increased, that, starting with  $\text{H}-\text{O}-\text{Cl}$ , the first increment of heat energy raises the Cl valence from 1 to 3, giving us the form  $\text{H}-\text{O}-\text{Cl}=\text{O}$ , with one added O atom, and that thereafter, the Cl valence remaining 3 throughout, the addition of the next O atom breaks the oxygen double bond and forms the ClO, ring, giving us the

much more stable form  $\text{H}-\text{O}-\text{Cl}$   (the ring giving the increased stability), and that, finally, the last addition of O rup-

tures the ClO, ring, giving us the final form,  $\text{H}-\text{O}-\text{Cl}$  .

or, in other words, we adopt series 3 as the most likely of the four series of structural formulas (3 to 6, inclusive), which, as already pointed out, has been favorably discussed by Tilden in the last edition of his "Chemical Philosophy," the forms being respectively:



In this thesis some considerable space is devoted to various lines of related evidence which tend more or less to confirm the final conclusion reached and which have in themselves more or less of independent interest, but it would be impossible in the space allotted to this abstract to refer to them in detail. Some of the more interesting of these propositions may perhaps be published hereafter in the chemical journals as independent papers.

VIII.

INFLUENCE OF VARYING STRENGTH SOLUTIONS  
OF FORMALDEHYDE ON ENZYMES  
OF ANIMAL ORIGIN.\*

BY T. M. PRICE, B.S., M.S.,  
Instructor in Bio-chemistry.

The study of the influence of preservatives upon the digestive enzymes was undertaken with the object of determining the minimum amount of formaldehyde, boric acid, borax, and salicylic acid required to preserve milk for forty-eight hours, the effect of the several preservatives upon the digestibility of the milk being subsequently determined by feeding the treated milk to calves. A number of experiments were also carried on to determine the minimum amount of formaldehyde that could be added to milk without affecting the action of certain animal enzymes *in vitro*, and, in addition, the effect of formaldehyde upon some of the more common bacteria was studied. The work with animals was started in 1900 and carried out at two different times at the Maryland Agricultural Experiment Station—first in the winter of 1900-1901, when the milk was fed immediately after it was treated with the preservative, and, secondly, in the winter of 1901-1902, when the feeding was done after the milk had stood twenty-four hours in contact with the preservative in a comparatively warm room.

The general plan of this work was to feed the calves when they were about two weeks old during a preliminary period of six days, and then a regular period of three days, the analysis of the food given being made during the entire period while the undigested material was analyzed only during the three days of the regular period. Eight different animals were fed, both with treated and untreated milk, and to make the test as

\*A thesis presented to the Faculty of the School of Graduate Studies of the Columbian University in part satisfaction of the requirements for the degree of Doctor of Philosophy, Washington, D. C., 1903.

fair as possible some calves were fed first with one kind of preservative, some with another, and others with untreated milk. The milk was obtained from the same cow, and about the quantity required to keep the animal in a growing condition was fed, the amount being the same for all calves. The amount of preservatives added was, with the exception of formaldehyde, the minimum amount found necessary to keep the milk for forty-eight hours, viz., Borax, 1 part; milk, 675 parts. Boric acid, 1 part; milk, 1,000 parts. Salicylic acid, 1 part; milk, 1,000 parts. Formaldehyde, 1 part; milk, 1,000 parts. The amount of formaldehyde added was in excess of the amount that it required; but it was my intention, if this amount had any bad effects, to diminish the proportion added to 1 part formaldehyde, 20,000 parts milk, which is the proportion actually required. As events turned out, I found it unnecessary to try the smaller amount.

The average of the two years' work showed that .76 per cent more protein and .96 per cent more fat were digested when the milk was preserved with formaldehyde in the proportion of 1:10,000 than when it was fed without a preservative. When the milk was preserved with salicylic acid there was a difference of 5.07 per cent protein and 3.71 per cent of fat in favor of the untreated milk. When the milk was preserved with boric acid there was a difference of 1.73 per cent of protein and .08 per cent of fat in favor of the untreated milk. When milk treated with borax was fed there was a difference of 1.30 per cent protein and .02 per cent fat in favor of the milk without the preservative. Although some of the preservatives showed bad effects, formaldehyde, when used in the proportion of 1:10,000, apparently did not interfere with the activity of the digestive enzyme as tested on calves.

These results with formaldehyde having shown that this preservative was not deleterious in its action on the calves' digestive enzymes in the strength solution used, I determined by experiment what strength solution of formaldehyde was necessary to cause interference in the action of rennet, pepsin, pancreatin, steapsin, ptyalin, amylopsin, and galactase *in vitro*. The fresh extracts of the various glands obtained directly from

the healthy animals were used for the digestive enzymes. The results were as follows:

*Effect of Formaldehyde on Rennet.*—My results show that formaldehyde added to milk in the proportion of 1 : 2500 does not interfere with the coagulating properties of the enzyme rennet, while the proportion of 1 : 1875 retards the action and the proportion of 1 : 500 renders it incapable of coagulating the milk in eighteen hours.

*Effect of Formaldehyde on Pepsin.*—It was found that upon the addition of formaldehyde in the proportion of 1 : 50 the pepsin digestion was retarded, while in stronger solution, or in the proportion of 1 : 25, the digestion was materially interfered with, and in the proportion of 1 : 125 or less the digestion was normal with the control.

*Effect of Formaldehyde on Pancreatin.*—At the end of eighteen hours untreated milk showed the absence of all proteid precipitated by magnesium sulfate and the tubes containing formaldehyde in the proportion of 1 : 2000 or less the same, while in the tubes containing formaldehyde in the proportion of 1 : 1500 or more, the digestion was not complete.

*Effect of Formaldehyde on Steapsin.*—Formaldehyde in the proportion of 1 : 35 prevented the action of steapsin, and in the proportion of 1 : 50 the action of steapsin was retarded, while weaker solutions had no effect on the activity of the enzyme.

*Effect of Formaldehyde on Ptyalin.*—The results from the experiments with ptyalin showed that the ptyalin action on starch was interfered with only after formaldehyde had been added to the starch in the proportion of 1 : 1250, while in the proportion of 1 : 1500 or less the ptyalin activity was normal.

*Effect of Formaldehyde on Amylopsin.*—The action of amylopsin was interfered with when formaldehyde was added to the starch in the proportion of 1 : 500, while in the proportion of 1 : 1000 or less it had no marked effect.

*Effect of Formaldehyde on Galactase.*—The results from this experiment showed that formaldehyde retards the action of the enzyme galactase when used in the proportion of 1 : 5000, but in weaker solutions it seems to have little effect.

Formaldehyde having been found to be harmless in its effect on the activity of these enzymes when used in such strength solutions as are necessary for preserving food material, and there being often danger of development in foodstuffs of various organisms which may be taken into the system through the food and liberate toxins which produce serious trouble, it was of interest to determine whether the formaldehyde would arrest development or kill the organism when it came in contact with it in the foodstuff. Some of the more common bacteria, such as *bacillus acidi lactici*, *bacillus typhosus*, *bacillus communis*, and *staphylococcus pyogenes aureus*, were used in the experiment.

I found that it required formaldehyde solutions in the proportion of 1 : 1560 to destroy the organisms in twenty-four hours, while the proportion of 1 : 1870 destroyed the organisms in seventy-two hours, and the development of the organisms was prohibited by formaldehyde in the proportion of 1 : 20,000.

#### CONCLUSIONS.

From all of these experiments the following conclusions may be drawn :

1. Formaldehyde added to milk in the proportion of 1 : 20,000 preserves the milk for forty-eight hours.
2. Formaldehyde added to milk in the proportion of 1 : 10,000 does not interfere with the digestibility of the milk when it is fed to calves.
3. Upon feeding calves through a long period with milk preserved with formaldehyde, the calves remain healthy and gain in weight.
4. Formaldehyde added to milk in the proportion of 1 : 2500 or less has no effect on the activity of the fresh enzymes rennet, pepsin, pancreatin, and steapsin *in vitro*.
5. Formaldehyde added to starch in the proportion of 1 : 2500 or less has no effect on the conversion of the starch by the enzymes ptyalin and amyllopsin *in vitro*.
6. Formaldehyde added to milk in sufficient quantity to preserve the milk for forty-eight hours—i. e., 1 : 20,000—does not interfere with the action of the enzyme galactase *in vitro*.

7. Formaldehyde added to milk in the proportion of 1:20,000 prevents the development of the more common bacteria, and when added in the proportion of 1:1560 it kills these bacteria in twenty-four hours.

8. Formaldehyde may be added to milk in sufficient quantities to preserve the milk and prevent the development of some of the more common bacteria—*i. e.*, 1:10,000—and still have no deleterious effect on the digestibility of the milk for calves.

9. Formaldehyde should never be fed to calves as a milk preservative stronger than 1 part formaldehyde gas to 10,000 parts of milk.

## SCIENTIFIC NOTES.

We quote the following reference to James Carroll, M.D., Professor of Bacteriology and Pathology, from *American Medicine*, November 26, 1904, under editorial comment:

"Some of the friends of Dr. James Carroll have from time to time suggested that his brilliant and courageous work in connection with yellow fever had won for him the right to some special recognition in official life, and it has been suggested that the least that could be done for him would be to promote him to the grade of full surgeon, thus giving him rank and pay of a major in the army. We now understand that some of his friends are urging special legislation looking to such a step, and we believe *American Medicine* voices not only the feeling of Dr. Carroll's personal friends, but also of the entire medical profession of the country, when we say that this movement has our full endorsement and our best wishes for success. Dr. Carroll is now first lieutenant and assistant surgeon. He has worked his way up from the ranks by hard, conscientious, faithful, and courageous labor. We Americans have reason to be proud of him, and to hope that the government will reward him for his work, especially in connection with yellow fever."

THE work of George P. Merrill, Ph.D., Professor of Geology and Mineralogy, upon the Non-metallic Minerals, their Occurrence and Uses, has attracted favorable attention from geological periodicals. We extract the following from the critical review in *Engineering News*, April 14, 1904:

"Professor Merrill here brings together widely scattered notes and references relating to the occurrence and uses of sundry minerals of economic value other than as ores or metals. \* \* \* The method of treatment is concise, but very satisfactory. Each element or mineral is described as to its characteristics, chemical composition, origin, locality, methods of extraction and its uses. In this connection the author gives much useful as well as very interesting information. \* \* \* Professor Merrill has produced a useful book, combining in one volume much information that has been widely scattered and inaccessible for practical use. A good index adds to its value, and one of its best features is a bibliography appended to each description, which gives the specialist the opportunity of studying any one non-metallic mineral in its fullest detail."

A. F. A. KING, A.M., M.D., Dean Emeritus of the Department of Medicine and Professor of Obstetrics and the Diseases of Women and Children, who in 1883 put forward and supported the theory of transmission of malaria by mosquitoes, has more recently (*American Journal of Medical Sciences*, February and June, 1902) brought out a new hypothesis concerning the biology of *Plasmodium malarie*. He maintains that the sporulation of successive groups of this parasite, by which the successive paroxysms of intermittent fever are produced, will not take place in the dark or in violet or purple light. For its sporulation the parasite requires solar light, or at least light from the red end of the spectrum.

In support of his hypothesis he maintains:

1. That the accumulated experience and observations of centuries, which have been held to prove the agency of solar *heat* in "causing" malarial fever, may also be held to prove the agency of solar *light*.
2. Paroxysms of malarial fever will not, as a rule, take place at night, in the dark.
3. The relative liability and relative immunity of different races of men to malarial fever depend respectively upon the relative translucency or non-translucency of their skin, and probably of their blood.
4. In places where malarial fever prevails the disease is increased by bright, sunny weather and lessened by clouded skies.
5. It has long been a popular tradition (learned by individual experience) that to prevent the occurrence of ague or to forestall its recurrence when it has once occurred it is advisable to keep in the shade and avoid sunlight.
6. The malarial parasite is a naked amœba. Red light promotes the vital activities of other forms of amœbæ (*Amœba proteus*), while violet or purple light restricts them. The color of the light diffused through the blood is necessarily red.
7. The curative action of quinine is explicable (in conformity with these views) by its fluorescence, the ultra-violet rays being inimical to the plasmodium. Similarly, esculin (the bitter principle from the bark of the horse chestnut tree) and fraxine (from the bark of *Fraxinus excelsior*, the common ash of Eu-

rope), both of them fluorescent substances, were successfully used for intermittent fever before the discovery of quinine. So, too, methylene blue and Prussian blue have been successfully used, and also tincture of iodine, this last coming in contact with starch in the stomach to form the purple iodide of starch.

Finally, it was demonstrated by Drs. Rhoads and Pepper, of Philadelphia, so far back as 1868, that in malarial patients the normal fluorescence of the blood was diminished, and that when this was restored by taking fluorescent substances the intermittent fever was checked.

It is interesting to relate that Dr. Gunni Busck, of the Finsen Medical Light Institute, Copenhagen, in reviewing Dr. King's papers (*American Journal of Medical Sciences*, July, 1904) cites the experiments of Tappeiner, to the effect that the destructive effect of fluorescent substances upon *infusoria* is greatly increased by sunlight; and the investigations of Ullman, which show that *paramacizæ* placed in solutions of quinine die much sooner under sunlight than when kept in the dark. Hence he suggests the advisability of treating malarial patients with sun baths in addition to quinine in order to increase the favorable effect of the medicine.

It remains, however, to be demonstrated that the effect of light upon malarial plasmodiæ in the blood is the same as upon *infusoria* and *paramacizæ* placed in solutions of quinine. Clinical experience alone can determine the truth of the matter.

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#### UNIVERSITY APPOINTMENTS.

*Assistant Professor of Economics, from January 1, 1905:* CHARLES WILLIAM AUGUSTUS VEDITZ, Ph.B., University of Pennsylvania, 1891; graduate courses Halle University, 1891-'93, Ph.D., 1893; Berlin, 1893-'94; Leipsig, 1894-'95; Paris (LL.B.), 1896-'99; studies in economics, public law, sociology, history, Paris School of Anthropology, 1896-'98; School of Political Science, 1898-'99; Sorbonne, 1897-'98; Ecole des Hautes Etudes, 1896-'97; College des Sciences Sociales, 1898-1900; Professor of Bates College, Lewiston, Maine (1901-'04); Member American Economic Association, American Academy of Political and Social Science. Author: The Philadelphia

Gas Works, 1891; The Recent Development of American Pottery, 1891; Thuenen's Wortlehre, Halle, 1896; Gide's Political Economy, 1903; also contributor of sociological articles to the New International Encyclopedia and various economic and sociological magazines, and one of the experts employed by the United States Industrial Commission in the preparation of Vol. XVII of its report.

#### UNIVERSITY MISCELLANEA.

AT the meeting of the American Philosophical Association in Philadelphia, December 28-30, Prof. J. Macbride Sterrett presented a paper entitled "Methods of Studying the History of Philosophy."

PROF. MITCHELL CARROLL attended the meeting of the Council and the scientific session of the Archæological Institute of America, which met in Boston, December 28-30, and read before the latter a paper on "Thucydides and Pausanias and the Dionysium in Limnis."

DR. JAMES CARROLL's address at the opening of the Surgical Building and New Clinical Amphitheater of the Johns Hopkins Hospital, October 10, 1904, appears in full in the December number of the Johns Hopkins Hospital Bulletin.

WE are glad to present in this number the paper of Rev. Edward B. Pollard, Ph.D., D.D., formerly Professor of Biblical Literature in this University, which was read at the International Congress of Arts and Science in St. Louis. Dr. Pollard is now pastor of the Baptist Church of Georgetown, Ky., and Professor of Biblical Literature in Georgetown College, and is a frequent contributor to theological publications.

MR. EDWARD MACKAY CHACE, formerly a student and later an assistant in the Chemical Department of this University, has just published jointly with L. M. Tolman and L. S. Munson, Bulletin 87 of the Bureau of Chemistry, Department of Agriculture, on the "Chemical Composition of some Tropical Fruits

and their Products." This is a new field of research, which was made possible by the residence of Mr. Chace in Cuba, when he collected the specimens and made the analyses of the fresh fruits.

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IN the Alumni Bulletin, issued last June, in the list of gentlemen upon whom honorary degrees were conferred at our last commencement, the name of Mr. Alexander Tait Stuart was inadvertently omitted. Mr. Stuart was graduated from the Columbian College in 1869, receiving the degree of Ph.B. He entered upon public school work and had served for twenty-two years as supervising principal of the Third school division in this city, when, on July 7, 1900, he was appointed Superintendent of the Public Schools of the District of Columbia. Throughout his career he has evinced a special aptitude for this work, as he possesses a marked capacity for organization and the gift to discern that which is best and most suitable in educational methods. In recognition of his valuable services in the cause of education, the degree of Master of Arts was conferred upon him by this University.

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THE ALUMNI ASSOCIATION is preparing for immediate publication an "Address Book" of the Alumni. This will contain an alphabetical list of the Alumni, giving the year of graduation, the occupation, and the present mail address. There will be given also a list arranged according to states and cities. The book will contain information about more than thirty-two hundred graduates, and will be compiled from replies sent in by the Alumni in response to request from the Secretary. It is hoped to have it ready by March.

The organization of the Alumni in different parts of the country is progressing rapidly. The "Puget Sound Alumni Association" was organized in Seattle last spring; and preliminary steps to organize associations were taken in other cities. Since then an organization has been formed in Salt Lake City; a meeting will be held in Denver in January; in New York and in Boston calls will soon be issued for meetings. Steps are to be taken at once to promote associations in Chicago, Cleveland, Cincinnati, St. Paul, and Minneapolis, San Francisco, Los Angeles, and St. Louis.

AMONG the books prepared by professors in the University that have recently appeared or are announced for publication are the following :

1. The Organization and Management of Business Corporations. By Walter C. Clephane, LL.M., Professor of Equity Pleading and Practice, and Organization of Corporations.
  2. Arbitration and The Hague Court. By John W. Foster, LL.D., Professor of Diplomacy and Treaties of the United States. Houghton, Mifflin & Co.
  3. The Freedom of Authority. By J. Macbride Sterrett, A.M., D.D., Head Professor of Philosophy.
  4. History of the American Revolution. By C. W. A. Veditz, Ph.D., Assistant Professor of Economics. George Barrie & Sons, Philadelphia.
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THE Two Hundredth Anniversary of the death of John Locke was commemorated November 12, at 5 o'clock, in University Hall, under the auspices of the Society for Philosophical Inquiry. Papers were read on "Locke on Government," by President Needham, of this University; on "Locke's Influence on Modern Psychology," by the Rev. Dr. E. A. Pace, of the Catholic University of America; on "Locke's Metaphysics of Causality and Space," by Dr. William T. Harris, U. S. Commissioner of Education; on "Locke's Personality," by Hon. Frank Warren Hackett; and on "Locke as a Physician," by Dr. William Osler, of Johns Hopkins University. The celebration was followed by a dinner at the Shoreham, which was largely attended by members of the Society.

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THE Calvary Baptist Church of this city celebrated December 2-5 the twenty-fifth anniversary of the pastorate of Rev. Dr. S. H. Greene, who has been a member of the Board of Trustees of this University since 1889, and was for several years Chairman of the Board. Doctor Greene was also acting President of the University from 1894 to 1895, and from 1900 to 1902. He is now chairman of the Trustees of Columbian College. At a dinner given in honor of Doctor Greene, as the opening event of the celebration, letters of greeting and congratulation were read from a large number of university and college presidents, from leading divines of the Baptist and other denominations,

and from men prominent in public life, testifying to Doctor Greene's value as man, educator, and citizen as well as minister. In the speeches that followed the dinner, Mr. Eugene Levering, of the Board of Trustees, represented the University.

THE reappointment of George Horton, Litt.D., of this University (1903), as United States consul to Athens is an event of great interest to university men. In restoring Doctor Horton to this important post, President Roosevelt has recognized the principle that the Athens consulate should be filled by a man who, in addition to his business qualifications, demonstrated in his former tenure, is himself a Greek scholar and capable of entering into thorough sympathy with the modern Greeks. It is generally understood that a memorial was presented to the President, consisting of letters from about sixty of the leading classical scholars in America, endorsing Doctor Horton and asking that he be restored to the consular service. This recognition of literary attainment as a qualification for the Athens post is gratifying to all who are interested in the promotion of classical studies. Doctor Horton is the author of numerous works in prose and verse, notably "Songs of the Lowly," "In Unknown Seas," "Aphroessa" (1898). "Like Another Helen," "Modern Athens" (1901), "The Long Straight Road" (1902), and "In Argolis" (1902). A new Greek story, "The Monk's Treasure," is announced by the Bobbs-Merrill Co. to appear in January. Doctor Horton has been invited to make during January a lecture tour for the Archæological Institute of America.

At its meeting in November the Trustees of the University, upon recommendation of the University Council, adopted the following classification of the educational work of the University:

Department of Arts and Sciences, with divisions as follows:

(a) Columbian College: Courses leading to the degree of Bachelor of Arts and Bachelor of Science.

(b) Graduate studies: Courses leading to the degrees of Master of Arts, Master of Science, degrees in engineering, and the degree of Doctor of Philosophy.

(c) Architecture: Courses leading to the degree of Bachelor of Science in Architecture.

Department of Medicine :

(a) Medical ; four year course leading to the degree of Doctor of Medicine.

(b) Dental ; three-year course leading to the degree of Doctor of Dental Surgery.

Department of Law and Jurisprudence ; three-year course leading to the degree of Bachelor of Laws ; graduate course, one year, leading to the degree of Master of Laws ; graduate course, three years, leading to the degree of Doctor of Jurisprudence.

Department of Politics and Diplomacy ; two-year course leading to the degree of Master of Diplomacy ; three-year course leading to the degree of Doctor of Philosophy.

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THE Columbian Women, an organization composed of Alumnae, wives of Trustees and of members of the Faculty, and women students of the University, was formed in 1893, for the advancement of women by founding for them scholarships in the various departments of the University, and by other means ; also for the promotion of the general interests of the University. It has devoted itself mainly to collecting funds for a scholarship to be known as "The Columbian Women Scholarship." During recent years some other interests of the University seemed more immediately urgent ; consequently money was raised for the University Hospital and for reference books for the Library. This winter, however, all efforts are being directed toward increasing the scholarship fund. As a competition scholarship does not always reach the person most in need of assistance, the Columbian Women desire to establish a "Loan Fund" similar to that of the Vassar Aid Association, which may be borrowed by a woman student in any of the departments of the University to enable her to complete her work, either in the regular course or in graduate studies. This loan is to be paid back, without interest, as soon as the borrower is able to do so. Miss Janet McWilliams is President of the Columbian Women.

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THE Board of Lady Managers of the University Hospital, formed at the time of the inception of the Hospital, continues to perform its labors in its chosen field with energy and never-

tiring love for humanity. The Board consists of ninety women, who meet monthly and consider the various needs of the Hospital and plan how best to meet them. In order to employ the energies of all to the greatest advantage, the Board is divided into various committees, to each committee being delegated some special feature of the Hospital work to foster and care for. During each year about Thanksgiving time a day is set apart for donations, known as Donation Day. This year the donations of moneys and foods were very liberal. This function, it is hoped, will be made each year a more prominent feature of the Board's labors. One of the annual events also arranged by the Board is the Students' Charity Ball. This ball, although it has only been held twice, has become already quite an established social function, as well as the social event of the year of the student body. The time given to the preparation for the event this year was only three weeks, and the attendant success, as well as pleasure given to all who attended, demonstrates the excellent executive ability and effort that the Board displayed. The net receipts from the ball will be about \$1,200. Mrs. Charles W. Richardson is President of the Board of Lady Managers.

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On the evening of November 30 a large number of the college women met in West Hall and formed themselves into an organization to be known as the Woman's League of the George Washington University. The purpose of the league is to bring the women into closer relation with one another, make each one conscious of a fellowship that does not spring out of mere meetings for class work, to promote the feeling of responsibility of the upper-class girls toward those coming in new, to discuss questions of interest to them as a body, and to advance their college interests generally. Every woman taking work in the University is eligible to membership, and will be cordially welcomed into the league. The advantages of such an organization have been realized in many of our co-educational institutions. The future of the new league bids fair to be a bright one. The first social affair was given on the evening of December 13 and was a fine success, due both to the enthusiasm of the girls and the fine program prepared by the committee on entertainment.

About three-fourths of all the girls studying in the University and a number of the ladies of the Faculty were present. Miss Maud E. McPherson is President of the Woman's League.

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THE annual meeting of the George Washington Memorial Association was held at Rauscher's on Wednesday, December 14. The president, Mrs. Archibald Hopkins, opened the meeting with an address recalling the events of the year, dwelling especially on the agreements of the Association with the Columbian University, whereby the University changed its name from Columbian to the George Washington University and the Association pledged itself to raise the sum of \$500,000 to construct the central building of the proposed new University group in Van Ness Park. This building, the administration building of the University, was to receive the name of "The George Washington Memorial Building." The president laid stress upon the need in Washington of such a building, which should contain an auditorium for meetings of international tribunals and of scientific organizations.

The Executive Committees of the University and of the George Washington Memorial Association have already designated the architects who were to compete for the memorial building. The Park Commissioner, the Committee for Greater Washington, Mr. McKim, Mr. St. Gaudens, Mr. Olmstead, and Mr. Burnham, with whom is associated Mr. Bernard R. Green, have consented to act as jury of award, and the date of the competition will be fixed as soon as the program, which was being prepared by Professor Percy Ash, of the University, should be finished and submitted to the jury.

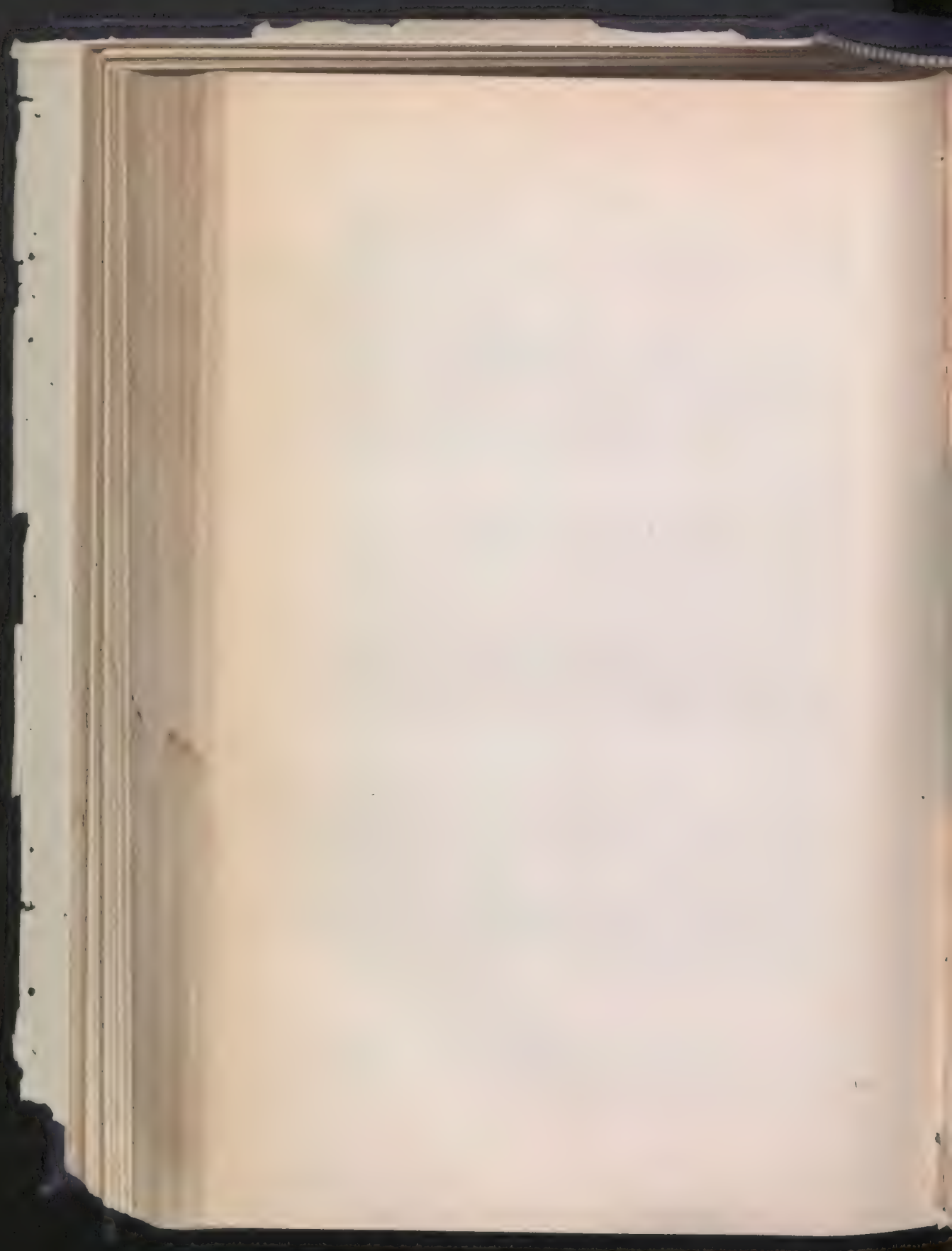
The most vital problem, therefore, which the Association had to solve was the raising of funds for the Memorial Building. Fifty thousand dollars were already in the possession of the Association, and the Association desired to raise fifty thousand more before March, 1905, so that the building could then proceed.

The president felt justified in saying that the outlook was most encouraging. The enthusiasm of California and of Utah had been rekindled by the recent visits of Dr. Needham; in Ohio and South Dakota interest was reviving, and Virginia,

Maryland, Pennsylvania, and New York were organizing meetings to be held in January and February. Meanwhile, literature was being prepared, plans carefully considered, and state organizations perfected. All was as yet tentative; yet, in view of the work of the past year, the evident reawakening of interest, and the hearty coöperation of the George Washington University, the future of the George Washington Memorial Association seemed to be full of promise. The President then called upon Dr. Needham.

In his address Dr. Needham laid especial emphasis on the national and scientific character of the Governing Board of the George Washington University, and gave a brief sketch of the organization of the University, which had in view primarily graduate and professional studies, but grouped about this higher University work, as feeder to it, the organization provides for a number of independent colleges for undergraduate students, governed by their own distinctive boards. The first of those, Columbian College, which embraced all the undergraduate work now being done in the University, has now 401 students, this organization combining the essential features of the English idea, of Oxford and of Cambridge, with the American idea of a University.

Dr. Walcott congratulated the Association upon the firm relations established during the past year with the George Washington University. Some fear, he continued, had been entertained that the Carnegie Institute, established for scientific research and for graduate work, would materially interfere with the prosperity of the University. This apprehension, however, had been removed, for, by the election of Dr. Woodward as its President, the Carnegie Institute definitely limited its sphere purely to scientific research. The Committee on Nominations having presented the names of the officers of 1903-04 for re-election, these officers were unanimously re-elected by the Association for the year 1904-05.



# THE GEORGE WASHINGTON UNIVERSITY

(FORMERLY COLUMBIAN)

## BIBLIOGRAPHY

TITLES OF BOOKS, MONOGRAPHS, PAPERS, ETC., PUBLISHED BY  
MEMBERS OF THE FACULTIES, DOCTORS OF PHILOSOPHY  
AND DOCTORS OF CIVIL LAW

PUBLISHED BY THE UNIVERSITY AT WASHINGTON, D. C.  
SEPTEMBER 1, 1904



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### EDITORIAL NOTE.

This bibliography is intended to embrace the important publications of present members of the Faculties of The George Washington University (formerly Columbian) and of graduates of the University on whom have been conferred the degrees of Ph. D. and D. C. L. The books and papers mentioned may be classified in general as contributions to philological, historical, mathematical, physical, medical, economic, and legal science, but it has been thought best to arrange the list alphabetically according to the names of the authors. The information given has been furnished by the authors themselves. The abbreviations used are current in scientific publications, but for convenience a list of those occurring most frequently is appended. The order of statement adopted in the case of books is title, place, publisher, date, number of pages; in the case of contributions to periodicals, title of paper, periodical, volume, series, pages inclusive, date, etc. (*e. g.*, *Am. J. Arch.*, 8 [2], 88-91; 1904). These pages have been prepared under the editorial supervision of Professor Carroll, with the assistance of Professors Munroe, Phillips, and Vance.

CHARLES W. NEEDHAM,

MITCHELL CARROLL,

CHARLES E. MUNROE,

D. KERFOOT SHUTE,

HENRY ST. GEORGE TUCKER.

*Committee on Scientific Publications.*

## ABBREVIATIONS.

- Am. Chem. J.—American Chemical Journal.  
 Am. Geol.—American Geologist.  
 Am. J. Arch.—American Journal of Archaeology.  
 Am. J. Med. Sc.—American Journal of Medical Science.  
 Am. J. Sc.—American Journal of Science.  
 Am. Met. J.—American Meteorological Journal.  
 Am. Nat.—American Naturalist.  
 Ann. Am. Acad. Pol. and Soc. Sc.—Annals American Academy of Political and Social Science.  
 Arch. Pediat.—Archives of Pediatrics.  
 Bull. Geol. Soc. Am.—Bulletin Geological Society of America.  
 Bull. Phil. Soc.—Bulletin of the Philosophical Society, Washington.  
 Bull. Torr. Bot. Club.—Bulletin Torrey Botany Club.  
 Contr. Smith. Inst.—Contributions of the Smithsonian Institution.  
 J. Am. Chem. Soc.—Journal American Chemical Society.  
 J. Am. Med. Asso.—Journal American Medical Association.  
 J. Geol.—Journal of Geology, Chicago.  
 J. Spec. Phil.—Journal of Speculative Philosophy.  
 Mo. Weather Rev.—Monthly Weather Review.  
 Nat. Geog. Mag.—National Geographic Magazine.  
 Nat. Med. Rev.—National Medical Review.  
 Pol. Sc. Quart.—Political Science Quarterly.  
 Pop. Sc. Mo.—Popular Science Monthly.  
 Proc. A. A. A. S.—Proceedings American Association for the Advancement of Science.  
 Proc. Am. Acad. Sc.—Proceedings American Academy of Science.  
 Proc. Am. Metr. Soc.—Proceedings American Metrological Society.  
 Proc. Am. Phil. Asso.—Proceedings American Philological Association.  
 Proc. Asso. Am. Anat.—Proceedings Association of American Anatomists.  
 Proc. U. S. Nat. Mus.—Proceedings United States National Museum.  
 Proc. Wash. Acad. Sc.—Proceedings Washington Academy of Science.  
 Pub. Astr. Soc.—Publications Astronomical Society.  
 R. R. & Eng. J.—Railroad and Engineering Journal.  
 Sc. Am.—Scientific American.  
 Sid. Mess.—Siderial Messenger.  
 Smith. Inst. Rep.—Smithsonian Institution Reports.  
 Smith. Mis. Coll.—Smithsonian Miscellaneous Collections.  
 Trans. Am. Ped. Soc.—Transactions American Pediatric Society.  
 Univ. Med. Mag.—University Medical Magazine.  
 Wash. Med. Ann.—Washington Medical Annals.  
 W. B. Bull.—Weather Bureau Bulletin.  
 Zeita. f. Vermess.—Zeitschrift für Vermessungskunde.

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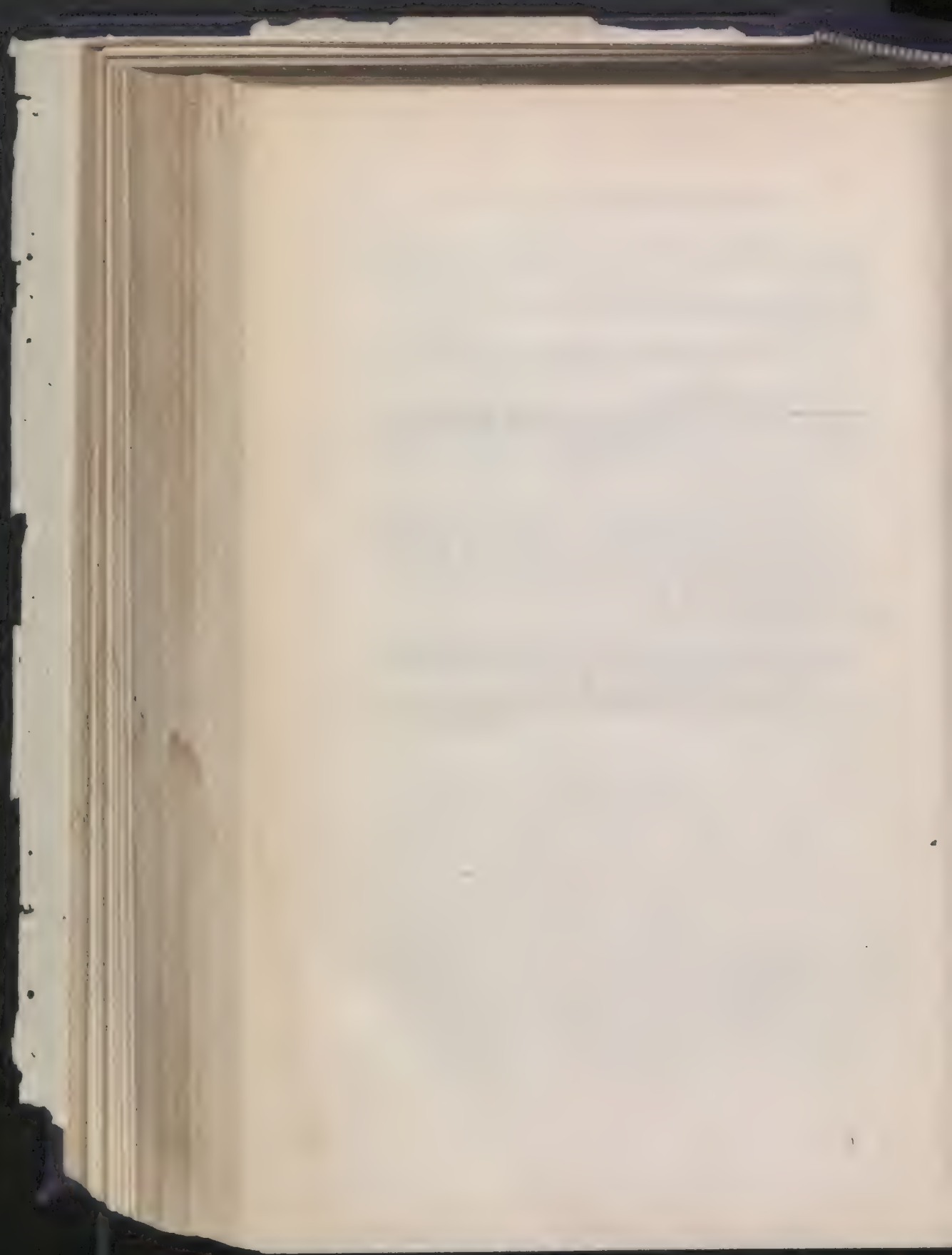
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## THE GEORGE WASHINGTON UNIVERSITY.

### THE RELATION OF EDUCATION TO PATRIOTISM.

"An institution is the lengthened shadow of one man."—*Emerson*.

George Washington in his last will and testament, written by his own hand and executed on the 9th of July, 1799, said:

"It has been my ardent wish to see a plan devised, on a liberal scale, which would have a tendency to spread systematic ideas through all parts of this rising empire, thereby to do away [with] local attachments and state prejudices, as far as the nature of things would, or indeed ought to admit, from our national councils. Looking anxiously forward to the accomplishment of so desirable an object as this is (in my estimation), my mind has not been able to contemplate any plan more likely to effect the measure than the establishment of a university in a central part of the United States, to which the youths of fortune and talents from all parts thereof might be sent, for the completion of their education in all the branches of polite literature, in the arts and sciences, in acquiring knowledge in the principles of politics and good government; and, as a matter of infinite importance, in my judgment, by associating with each other, and forming friendships in juvenile years, be enabled to free themselves in a proper degree from those local prejudices and habitual jealousies, which have just been mentioned, and which, when carried to excess, are never-failing sources of disquietude to the public mind, and pregnant with mischievous consequences to this country."

In a speech to both houses of Congress, December 7, 1796, President Washington said:

"Amongst the motives to such an institution, the assimilation of the principles, opinions, and manners of our countrymen, by the common education of a portion of our youth from every quarter, well deserves attention. The more homogeneous our citizens can be made in these particulars the greater will be our prospect of permanent union; and a primary object of such a national institution should be the education of our youth in the science of government. In a republic what species of knowledge can be equally important, and what duty more press-

ing on its legislature, than to patronize a plan for communicating it to those who are to be the future guardians of the liberties of the country?"

Again, writing from Philadelphia to the Commissioners of the Federal District, January 28, 1795, Washington said:

"The Federal City from its centrality and the advantages which in other respects it must have over any other place in the United States ought to be preferred as a proper site for such a university."

These are not the words of a partisan—they are the words of a patriot, inspired by the broadest patriotism. Washington sought an institution not for the institution's sake; in the federal city not for the federal city's sake; but an institution that should realize for the nation in the highest possible degree that unity of conception of federal power, that broad national charity among all the people that could be engendered only by bringing together at the seat of national government students from every part of the nation. Here they were to learn the science of state building—a state with absolute sovereignty over those activities which entitle the state to be one in the family of nations. The complex form of our government, so difficult for many to understand and yet so simple and perfect in its operation when understood, was to be studied from the seat of national power, where the governmental functions of national and international activities are being exercised and local interests subordinated and harmonized to the one great organic whole, to the end that the national government might stand before the world perfect and powerful as a great state.

The reasons given by President Washington for a university in the federal city have been greatly reinforced by instrumentalities which have grown up and developed since his day. The city has increased its population to three hundred thousand people without developing industrial or commercial enterprises. Its people are engaged in intellectual, social, and governmental pursuits. It has the largest permanent body of scientific investigators in the country, and is the national meeting place of educators and scientists. The discussion and determination of

public questions, the spirit of nationalism, and the intellectual life constitute an educational and humanizing influence of the greatest value in the development of the American scholar. The city possesses a decided academic atmosphere, and facilities of the greatest value to students.

Herbert Putnam, LL. D., Librarian of Congress, said, in June, 1903: "There are thus in the city of Washington thirty-four governmental libraries freely available for research. These libraries now contain in the aggregate over two million books and pamphlets and over a half million other articles literary in character—manuscripts, maps, music, and prints. If we add to them the contents of the District Library and of the libraries of private associations and institutions \* \* \* we shall have a total not merely greater than is to be found in any other city of this size in the world, but one which, in proportion to population, represents several times as many volumes per capita as exist for public use in any other city of the world."

Students can visit the sessions of the Congress of the United States and of the Supreme Court of the United States, and can examine the archives and library of the State Department, where national, diplomatic, and judicial history is being made. These are the original sources of knowledge upon these subjects. In the collections of the National Museum, the Smithsonian Institution, the Army and Medical Museum, the Museum of Naval Hygiene, and the departmental museums are found extensive series of specimens, many of them types of great value to the student of anthropology, archæology, mineralogy, paleontology, biology in all its branches, and other topics for research. In the Patent Office are the records and models of invention, many of which have modified the conditions under which we live.

In the experimental sciences are the Weather Bureau, with its appliances for the study of meteorology; the Coast and Geodetic Survey, through whose agency and work the figure of the earth and terrestrial magnetism are experimentally determined; the Hydrographic Bureau, which conducts the survey of foreign coasts and the study of ocean currents; the Bureau of Standards, which standardizes the instruments used in meas-

uring mass, volume, heat, light, electricity, and all other magnitudes; the Geological Survey, which investigates the structure of the earth, ascertains our mineral resources, and supervises the sources of supply and means for distribution and control of water for irrigation purposes; the Department of Agriculture, which exists primarily for conducting original investigations for the benefit of agriculture in all its branches, and is therefore provided with extensively equipped laboratories for the study of chemistry, botany, vegetable physiology, entomology, bio-chemistry, bacteriology, comparative pathology, parasitology, the physics and chemistry of the soil, forestry, and microscopy; the Naval Observatory and Nautical Almanac Office, where researches in astronomy and navigation are conducted; the Marine Hospital Service, which deals with national problems in hygiene; the Bureaus of Construction and of Steam Engineering of the Navy, having supervision over the designs and construction of our ships; the Bureau of Yards and Docks, having supervision over the engineering operations at our navy yards and naval stations; the Bureau of Equipment, which is charged with the electrical installations for the Navy; the U. S. Signal Corps, which has supervision over the electrical installations for the Army; the Engineer Corps of the Army, which is charged with river and harbor improvements, and the Light-House Board, which controls the system for lighting our navigable waters.

Of chemical laboratories for conducting the tests of materials, and especially for research work, there are now eighteen attached to the different departments at Washington. In the graphic arts there is especial activity, as map-making and chart-work is carried on in almost every bureau, while the Supervising Architect's Office of the Treasury Department is the largest office of its kind in the country. The student of pedagogy will find here abundant material collected by the U. S. Bureau of Education.

In the Bureau of Steam Engineering and of Construction and Repair, and Ordnance, of the Navy, there is projected and detailed more heavy work than probably in any other part of

the country. Here is also located the United States Navy or Ordnance Gun Factory, which is freely open to visits of inspection. The ordnance proving station is located but a few miles down the Potomac. Tours of inspection can be made to the large steel works and shipbuilding plants in Baltimore, while other trips can be made to the shipbuilding plant at Newport News. Washington is also the headquarters for military engineering, as the War Department has charge of all river and harbor improvements for the country, and here is located the headquarters of the Engineer School of Application for the Army. Observations of Patent Office methods will be found advantageous to any engineer. For students intending to pursue special research work or investigations, the opportunities for extending knowledge into the literature of a given subject are unequaled. The laboratories of the Agricultural Department offer superior facilities for all kinds of bacteriological investigations, and for the study of bio-chemistry, comparative pathology, and parasitology.

These facilities are provided and maintained at government expense; they have been gathered through years of effort by a large body of scientific workers and the expenditure of millions of dollars; their purchase and the cost of maintenance are far beyond the financial ability of any institution to undertake, and they are by act of Congress freely offered to students in the university.

THE GEORGE WASHINGTON UNIVERSITY is national in its aims. It was organized by an act of Congress, February 9, 1821, under the name Columbian. President Monroe, approving the charter, said:

"The act of incorporation is well digested, looks to the proper objects, and grants the powers well adapted to their attainment. The establishment of the institution within the federal district, in the presence of Congress, and of all the departments of the government, will secure to the young men who may be interested in it many important advantages, among which the opportunity which it will afford them of hearing the debates in Congress and in the Supreme Court on important subjects must be obvious to all. With these peculiar advantages, this institution, if it receives hereafter the proper encour-

agement, cannot fail to be eminently useful to the nation. Under this impression, I trust that such encouragement will not be withheld from it."

By act of Congress approved January 23, 1904, amending the charter, the university is made non-sectarian and authority given the board to change the name. Pursuant to this authority and with the approval of the Secretary of the Interior and the Commissioner of Education, and an agreement with the George Washington Memorial Association, the name was on September 1, 1904, changed to The George Washington University. The board of trustees was reorganized after this amendment of the charter, giving a wide representation to the country. Mr. Wayne MacVeagh, a member and chairman of the board, is from the state of Pennsylvania, and has an international reputation, having served the country in the cabinet, in the diplomatic service, and before international tribunals; Senator Jacob H. Gallinger, of New Hampshire, represents the Eastern States; Senator Francis G. Newlands represents the Pacific Coast; Governor Andrew J. Montague represents the South; Mr. Henry Kirke Porter, of Pittsburg, represents the Middle West; Mr. Eugene Levering and Mr. George O. Manning the adjoining state of Maryland; Hon. Henry B. F. Macfarland the District government; Mr. Charles D. Walcott, Director of the Geological Survey, and Professor Alexander Graham Bell, represent the scientific organizations of the District; the Alumni are represented by William F. Mattingly, Theodore W. Noyes, John B. Larnier, John Joy Edson, Myron M. Parker, and Doctor Charles W. Richardson; and other interests in the city are represented by Dr. Samuel H. Greene, Dr. Edward M. Gallaudet, Mr. S. W. Woodward, Mr. David A. Chambers, and Mr. William S. Shallenberger.

The university has over 4,600 alumni, so distributed over the country that, like its present student body of 1,500 students, every state in the union is represented, as well as eight foreign countries. With its national charter, illustrious name, national representation in the board of trustees, and the wide distribution of its student body, this university is thoroughly national, and thus meets the views expressed by him whose name it bears.

In 1903 the educational work was entirely reorganized and the University is now constituted as follows:

Department of Arts and Sciences, with divisions as follows:

- (a) Columbian College; courses leading to the degrees of Bachelor of Arts and Bachelor of Science.
- (b) Graduate Studies; courses leading to the degrees of Master of Arts, Master of Science, degrees in Engineering, and the degree of Doctor of Philosophy.
- (c) Architecture; courses leading to the degree of Bachelor of Science in Architecture.

Department of Medicine:

- (a) Medical; four-year course leading to the degree of Doctor of Medicine.
- (b) Dental; three-year course leading to the degree of Doctor of Dental Surgery.

Department of Law and Jurisprudence; three-year course leading to the degree of Bachelor of Laws; graduate course, one year, leading to the degree of Master of Laws; graduate course, three years, leading to the degree of Doctor of Jurisprudence.

Department of Politics and Diplomacy; two-year course leading to the degree of Master of Diplomacy; three-year course leading to the degree of Doctor of Philosophy.

Since the reorganization there has been an increase of about three hundred students, showing how quickly a response comes to all advances made in the work. With the needed new buildings proposed and the enlargement of its faculties by endowment, the university should soon become one of the largest in the country.

The assets of the university are valued at one million four hundred thousand dollars. Among the holdings are its ground at the corner of H and Fifteenth streets, in Washington, containing 20,175 square feet, with two buildings thereon, which will not be required when the university moves to its new site, and the Columbian building on Fifth street, a recently con-

structed steel fireproof office building, in every way modern and well tenanted, constructed by money contributed by William W. Corcoran, which will be better used for the purposes intended by the donor in constructing a university hall upon the new site, to be called Corcoran Hall. In view of these changes the trustees have adopted a plan to sell these two properties and with the proceeds—which will be ample—to pay (1) all the debts of the university, (2) reimburse the university for the purchase price of Van Ness Park, and (3) construct Corcoran Hall on the new site; this policy to be carried out while the new buildings are being constructed. This will leave the university entirely free of debt, and possessed of five acres of ground for its central buildings, which, with the remaining assets, will amount in value to nine hundred thousand dollars, exclusive of the new buildings hereafter referred to.

The university has purchased a site consisting of five acres, fronting the President's Park, south of the White House, and the Washington Monument grounds. It is the old Van Ness property, and is near the site selected by Washington for a university. It has adjoining and around it over one thousand acres of public grounds, and is within walking distance of all the splendid facilities for educational purposes enumerated above. Six prominent architects from Washington, Baltimore, New York, and Boston have been selected to prepare a general ground plan for the improvement of this site, and definite plans for the memorial building. The jury to decide the competition consists of Mr. Charles F. McKim, chairman, the other members of the Park Commission, and Mr. Bernard R. Green. It is expected that the final plans will be determined and accepted the first of the new year. Adjoining vacant property can be purchased, so as to increase the site to twenty-five or thirty acres when funds are available for the purpose.

The George Washington Memorial Association was started with a view to memorialize Washington's idea of a national institution and to provide a building for scientific research and graduate study.

A body of patriotic women, representing different parts of the United States, met in the city of Washington, and the result

of their conference was the incorporation, in September, 1898, of this association. The objects of the association, stated in the charter, are "to advance and secure the establishment in the city of Washington of an university for the purposes and with the objects substantially as set forth in and by the last will of George Washington, the first President of the United States, and to increase the opportunities for higher education of the youth of the United States." This movement was to provide for research and graduate work.

The membership of the association increased, and considerable sums of money were given and subscribed by educated and patriotic persons throughout the country to a permanent building fund held in trust by the Association for a proposed memorial building, the subscriptions and cash in hand amounting to about fifty thousand dollars.

Another movement was started by the Washington Academy of Sciences to establish educational facilities for research and graduate work. This resulted in the incorporation of the Washington Memorial Institution. The institution had before it the work of general research and the utilization of the facilities in the departments at Washington for graduate students. The establishment, in 1902, of the Carnegie Institution provided for the first object in view by the Memorial Association and the Memorial Institution—that of research work. The second object, an institution for graduate students, remained to be adequately provided for.

In the fall of 1903 conferences were held between the representatives of the Washington Memorial Institution and the university looking to suitable provision for graduate work. The university decided to have its charter changed, making the institution non-sectarian, to elect to membership upon its board of trustees representatives from the Memorial Institution, enlarging its courses and corps of professors and instructors to carry on the proposed graduate work in Washington. At the same time negotiations were entered upon with the George Washington Memorial Association looking to the fulfilment of its objects by the building of a George Washington Memorial to be used as an administration building for the

university under this reorganization. These conferences came to a very satisfactory conclusion.

At a meeting of the executive committee of the George Washington Memorial Association, in April, 1904, after due consideration of the plans of the university and its reorganization, the committee made a proposition to the university, suggesting that the association would co-operate upon condition that the university would take the name "The George Washington University."

On April 30, 1904, a meeting of the General Alumni Association of Columbian University was held in Washington, at which a statement was made by the president of the university concerning the proposed change of name, and the following resolutions were unanimously adopted:

"WHEREAS, The Alumni of Columbian University assembled in Washington this 30th day of April, 1904, have listened to the proposed plan for the change of name and the organization of an auxiliary corporation to be known as Columbian College, and the proposition of the George Washington Memorial Association to build an administration building upon the new site, to be known as the George Washington Memorial Hall, and to be used by Columbian University, upon condition that the name of the university be changed to The George Washington University; therefore,

"*Resolved*, That we approve said plans and recommend the acceptance of said proposition by the board of trustees;

"*Resolved*, That the president of this association convey to the George Washington Memorial Association our hearty appreciation of their interest in and co-operation with the plan to make the university national in its aims and work."

On May 2, 1904, at a meeting of the board of trustees of the university "Points of Agreement" were formulated and adopted by the trustees and forwarded to the president of the Memorial Association. These were submitted to the trustees of the George Washington Memorial Association at its semi-annual meeting on May 5, 1904, and were duly ratified. The agreement is as follows:

"*First*—The George Washington Memorial Association agrees to undertake the raising of sufficient funds, estimated to

be \$500,000, to construct the central building in the proposed university group of buildings upon Van Ness Park, the building to be known as the George Washington Memorial; the plans of the building to be approved by the executive committees respectively of the association and the university; the building to be used as the administration building of the university, and the auditorium for lectures, gatherings of an educational character, meetings of international tribunals, and of scientific organizations, under such regulations as the university shall from time to time prescribe. The university shall have charge of the construction, care, and maintenance of said building, and the building shall belong to and be the property of the university.

"*Second*—The university agrees to change its name in accordance with the provisions of the act of Congress approved January 23, 1904, to The George Washington University, the name to be approved by the Secretary of the Interior and the Commissioner of Education, as provided in said act, the change to go into effect and the name to be used on and after September 1, 1904. This name shall, upon completion of said building, be considered as adopted in perpetuity in pursuance of this agreement between the association and said university, and shall not thereafter be changed, the adoption in perpetuity being of the essence of this agreement.

"*Third*—The George Washington Memorial Association shall, upon the acceptance of these terms, by its board of trustees, forthwith proceed to complete its auxiliary state organizations, and proceed to secure the necessary subscriptions for said building, and steadily prosecute the same to completion, and in all matters of the presentation of this subject to its local bodies, the university, through its president, will co-operate with the association."

As before noted, the name was changed and has been in use since September 1, 1904, and representatives of the Washington Memorial Institution and the Association were elected to membership on the board of trustees of The George Washington University.

The aim of the board is to establish a university on what may be called the American type, strictly non-sectarian and carrying on only post-graduate and professional work. It will have affiliated with it, however, undergraduate colleges, doing strictly undergraduate work and having representation in the councils

of the university. Each college will be incorporated under the general laws of the District of Columbia, with a separate board of trustees, which shall have charge of the college, and be responsible for its conduct and maintenance. These colleges will be upon the general site of the university. Educationally they will be a part of the system of the university, catalogued under the Department of Arts and Sciences. The highest officer of a college will be a dean, and the dean and faculty of each college will be members of the university councils; all degrees will be conferred by the university upon the recommendation of the college faculties, the standard of admission and educational work in the colleges being approved by the university council. All laboratories of the university will be open to and courses conducted therein for undergraduates in the colleges without charge, except that all laboratory fees and breakage deposits will be fixed by and paid to the university. Undergraduate students pursuing their senior course may, with the consent of the college faculty, take elective or graduate courses in the university.

This arrangement will reduce the expense of undergraduate work in the colleges and give a university life to all the work. This feature follows in part the organization of the University of Oxford and of Cambridge in England. The first college to be organized under this plan is the Columbian College, established by the Baptist denomination. It is expected that other denominations, and possibly some patriotic organizations, will organize other colleges around the university upon this general plan. The board of trustees of the university will encourage the development of these colleges.

**MEMORIAL BUILDING.** The George Washington Memorial Association has undertaken the raising of \$450,000, in addition to its present available funds, to erect the memorial administration building. This building will be the center of the group on Van Ness Park. It will contain offices of administration, four large lecture rooms, an auditorium with a seating capacity of 2,000, and a memorial hall. In design it will be classical and fitting its environment. In this national enterprise

the association asks the support of all the friends of education who believe in utilizing the advantages in the city of Washington, and realizing the aims and purposes set forth in the writings of George Washington.

**ALUMNI.** The Alumni Association, by resolution, have undertaken to raise \$150,000, to construct a hall to contain a large dining room or commons, seating four or five hundred persons, reception, library and reading rooms, room for business meetings of the alumni, fraternities, committees, etc., with chambers for visiting alumni. This hall is to be the social center of university life. In this effort the alumni will appeal to all graduates of the university, as well as to friends of the university in the city of Washington, for contribution.

**TRUSTEES.** The trustees of the university are raising the sum of one hundred thousand dollars to prevent any deficiency in running expenses during the next five years, and to enlarge the educational work of the university to meet the increasing demands. During this period it is hoped the new buildings will be constructed, the two properties above referred to sold, and all the debts of the university paid, and it is confidently hoped that further endowment will be secured.

**DEPARTMENT OF POLITICS AND DIPLOMACY.** The study of politics, economics, and diplomacy can be carried on by graduate students in the city of Washington better than in any other place. It is here that political and diplomatic history is being made, and the official reports in reference to economic movements in the United States and all parts of the world are daily received. Congress, the executive departments, and the Supreme Court of the United States, are open to students. The university appeals to men of large means and patriotic impulses to contribute two hundred and fifty thousand dollars for a building and equipment for this special work, and five hundred thousand dollars as the beginning of an endowment for the department. This endowment will enable the university to add five distinguished professors upon the important subjects to be taught, and with the income from tuitions provide assistants and lecturers. The department had last year eighty students.

The university authorities propose to make this in every way a school of the first rank.

A GRADUATE DEPARTMENT OF PUBLIC HEALTH. This is intended to be a department of civics in the subjects of preventive medicine and constitutional and administrative law. Its principal aim will be to fit men for service upon public boards of health—national, state, and municipal—and to make a special study of the prevention of diseases. Much of this work is being carried on by the government in the departments here, and it only remains for the university to organize a faculty and arrange systematic courses of study. It can use its medical building already constructed. To inaugurate this work requires an endowment of two hundred thousand dollars. An appeal is therefore made to men who are interested in the prevention of human diseases, and also those who are interested in the quarantine of live stock throughout the country. It is evident to all familiar with the subject that in the proper administration of these laws a more thorough knowledge of preventive medicine and a knowledge of personal and property rights and administrative law are essential.

DEPARTMENT OF BIBLIOGRAPHY AND LIBRARY SCIENCE. Throughout the country we have many libraries, and in the states and at the national capital we have large and valuable reference libraries for students; of these the Congressional is the largest and best equipped. There is a growing and important demand, especially in the reference libraries, for students who have been broadly trained in bibliography as well as in library science. The storing, cataloguing and handling of books is of importance in every library, but the reference libraries require men and women who are specially qualified to give reliable information regarding books and manuscripts. There is a large demand for a school of this type at the national capital. The university has the room for this work and the Congressional Library will furnish the very best laboratory facilities. To begin the work requires an endowment of two hundred thousand dollars.

LABORATORIES. Laboratories are necessary for the enlarged work proposed by the university. Each of these buildings

should cover an area of 150 by 200 feet, and with the ground each building will cost from \$100,000 to \$150,000:

(a) *Chemical Laboratory.* Chemistry is essential in training students in any of the sciences, medicine, dentistry, public health, and other professions. It is a cultural subject as well and is offered in the arts courses. It must be taught in laboratories. Our present chemical laboratories are old and overcrowded. An independent, fireproof, modern laboratory building is imperatively needed, which will provide for the needs of the new undergraduate students, the professional courses, and research work.

(b) *Biological Laboratory.* Botany, zoology, physiology, and the other sciences relating to life and to vital processes, can be properly taught only by laboratory methods. The student must himself observe the processes and results. Washington is rich in museum collections, but the laboratory work must be done at the university.

(c) *Physical Laboratory.* The Physical Laboratory will provide for instruction and research in pure physics and electricity. It will contain a large lecture room seating two hundred and fifty students, and a number of smaller lecture and class rooms. For laboratory work there will be provided a large laboratory for general physics, and special rooms for work in electricity, sound, heat, and light. In addition there will be many smaller rooms for investigation and research for the use of instructors and advanced students.

(d) *Engineering Laboratory.* This laboratory will contain a number of class rooms and drawing rooms for engineering classes, but in the main it will be used for shop, laboratory, and testing purposes. Ample provision will be made for making and repairing the apparatus used in all departments for instruction and research, and for the training of students in the principal processes and appliances used in engineering. For the practical work of the students there will be dynamo laboratories, steam and gas engine laboratories, hydraulic laboratory, and testing laboratories for cements and metals.

(e) *Power Plant.* The power for laboratories and the heating and lighting of all the university buildings will be supplied

from the central power plant of the university, which will be in a separate building, placed between the physical and engineering laboratories, and will be arranged to afford opportunity for making tests of large machines under working conditions.

**DORMITORIES.** There are planned for Van Ness Park eight dormitory buildings, each building having eight suites of rooms consisting of a study and two bedrooms, closets, and bath. Adjacent grounds for additional buildings can be purchased at very reasonable prices. No better investment of endowment funds can be made, as these buildings will be upon unincumbered ground belonging to the university, and there are already students enough desiring these facilities to fill them at profitable rental. Community life in every educational institution is essential in stimulating the student, creating men of broad, healthful ideas, with a knowledge of affairs and strong, impulsive ambition. Men go out from institutions having this community life with ideas that have been tested in the laboratory of conversation, a familiarity with public questions, a self-possession and poise that can be obtained in no other way. These buildings will cost from fifteen to twenty thousand dollars each, according to finish.

This plan for developing and establishing a great university at the national capital calls for the support and contributions of generous and patriotic people. The money contributed will secure more than a university; it will enable the youth of the land to take advantage of these rare opportunities for study, and create a body of men in all the states whose conceptions of national power and its exercise will have been formed and unified by association and study at the seat of government, and whose acquaintance with men from every part of the union and from all the civilized nations of the earth will create a spirit of broad charity and loyal devotion to the Union.

CHARLES WILLIS NEEDHAM,  
*President.*

WASHINGTON, D. C.,  
*December 24, 1904.*

# SITY AT WASHINGTON

EDUCATION MEMORIAL



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 London, Eng.

q.w. School

Washington a university modeled after the plan  
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NEEDHAM,  
President.



From "Harper's Weekly"

August 1897

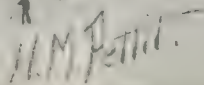
Memorial Hall

Through the efforts of the George Washington Memorial Society, founded in 1897, the purpose outlined in the will of George Washington, the Columbian University, by a special act of Congress, has agreed to provide the University with an administration building, to be known as the George Washington Memorial Hall, immediately south of the White House, fronting upon the President's Park, and the above is a plan of the proposed building. Architects have just been chosen to prepare in competition a quadrangle of buildings with the park commission and Mr. Bernard R. Green, has been appointed to make the

## English Literature Major

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1. *Leptocarpus* Malmgren



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 CINCINNATI, OHIO

Library and Law School

of which was to establish in the city of Washington a university modeled after the plan adopted by the American Congress, recently changed its name to The George Washington University. The Memorial Hall, now known as the George Washington Memorial Hall. The University has recently purchased a new site, and a tentative sketch prepared by Messrs. Hornblower & Marshall, of Washington, D. C., shows the Memorial Hall in the center. A jury, with Mr. Charles F. McKim as the chairman, awarded.



# COLUMBIAN UNIVERSITY.

## ORDINANCE

PROVIDING FOR THE ORGANIZATION AND CONDUCT OF THE  
DEPARTMENT OF PUBLIC HEALTH, WITH COURSES OF  
STUDY, ETC.

ADOPTED FEBRUARY 20, 1904.

Be it ordained by the Board of Trustees of Columbia University :

SECTION 1. That there shall be created in the University, as hereinafter provided, a department of civics, for the purpose of graduate education in the subjects of preventive medicine and the fundamental and administrative laws pertaining to the prevention of disease, epidemics, and injuries, which shall be designated as the "Department of Public Health."

SECTION 2. The following subjects shall be taught in said Department, viz :

*Hygiene.*—Subjects : Climate, soil, water supplies, food, personal hygiene, domestic and municipal sanitation in their relation to the public health ; vital statistics ; the etiology, history, and geographic distribution of infectious diseases and their prevention by approved sanitary measures. Lectures, conferences, and demonstrations during the entire course.

*Sanitary Chemistry.*—Subjects : Analysis of air, water, and various food products for the detection of impurities and adulterations ; the nutrient value of food products ; sewage analysis. Laboratory instruction during the entire course ; lectures and conferences as required.

*Bacteriology.*—Subjects: The morphological and biological characters of pathogenic bacteria, with special reference to their detection, differentiation, and destruction. Laboratory instruction during the entire course.

*Medical Zoölogy.*—Subjects: Pathogenic protozoa; metazoa injurious to man and the domestic animals, including an account of their life-histories, pathogenic action, detection, and destruction. Laboratory work throughout the course and lectures and conferences as required.

*Bio-Chemistry.*—Subjects: Immunity, natural and acquired; protective inoculations; toxins, anti-toxins, agglutinins, precipitins, bacteriolysins, and hæmolysins. Laboratory work throughout the course; lectures and conferences as required.

*Sanitary Administration.*—Subjects: Organization of Public Health Boards; administration of the sanitary service in different countries, states and municipalities; sanitary inspections; disposal of refuse and sewage; municipal control of communicable diseases. Lectures, conferences, and practical demonstrations.

*Sanitary Inspection Service, National and International.*—Including quarantine administration, sanitation and inspection service upon ships, railway cars and other public conveyances; the history of sanitary legislation; sanitary laws of the United States and of the several States; inspection of immigrants.

*Dangerous Occupations.*—Subjects: Chemical manufacturing operations; poisonous coloring matters in clothing and fabrics. Dangers attending the transportation, storage and use of explosives, compressed and inflammable gases and volatile and inflammable liquids. Fire risks; electrical risks; mining and quarrying; statistics of occupations; foreign laws and regulations; domestic laws and regulations; state and municipal laws and ordinances; organization of inspection corps.

*Sanitary Engineering.*—Subjects: Heating, lighting, and ventilation of dwellings and public buildings; drainage; sewer-construction; filtration of water-supplies, etc.

*Comparative Medicine.*—Infectious diseases of the lower animals, especially those which may be communicated to man—

tuberculosis, anthrax, glanders, rabies, actinomycosis ; inspection of meats and dairy products.

*Insects as Agents in the Transmission of Infectious Diseases.*

*International Law as Affecting Sanitary Regulations.*

*Constitutional and Statutory Law as Affecting Sanitary Regulations.*

*The History of Preventive Medicine.*

SECTION 3. The courses of study in the subjects aforesaid shall be arranged so as to give students a one-year course of resident instruction in the University, with satisfactory examinations, leading to the degree of Master of Public Health, and a two-year course in residence, leading to the degree of Doctor of Public Health, provided the candidate for the Doctor's degree shall be required, in addition to passing satisfactory examinations on the studies pursued, to present to the faculty a thesis, together with a satisfactory bibliography, exhibiting independent research, upon a subject to be approved by the faculty.

SECTION 4. Courses in the Department of Public Health shall be open to candidates for the degrees of Master of Arts, Master of Science, Civil Engineer, and Doctor of Philosophy, under the conditions set forth in the printed catalogue under the head of Higher Degrees in the Department of Arts and Sciences.

SECTION 5. Before a student can be admitted to candidature for the degree of Master of Public Health he must have taken the degree of Doctor of Medicine from an institution of learning whose degrees are recognized by this University, or give evidence that he has pursued and completed a full undergraduate course of medical study such as is required by institutions of good standing, antecedent to the degree of Doctor of Medicine.

SECTION 6. Before a student can be admitted to candidature for the degree of Doctor of Public Health he must have the qualifications required for the degree of Master of Public Health, and in addition thereto give evidence that he has completed a liberal undergraduate course of academic study such

as is required by colleges of good standing antecedent to the baccalaureate degree. The conditions of admission to this course by candidates for the higher degrees in the Department of Arts and Sciences shall be determined by the regulation set forth in the catalogue for admission to candidature for such degrees.

SECTION 7. The Faculty of the Department of Public Health shall consist of the President of the University, the Dean of the Department of Public Health, and the following professors: Professor of Hygiene, Professor of Sanitary Chemistry, Professor of Bacteriology, Professor of Medical Zoölogy, Professor of Bio-Chemistry, Professor of Sanitary Administration, Professor of Sanitary Inspection Service—National and International, Professor of the subject of Dangerous Occupations, Professor of Sanitary Engineering, Professor of Comparative Medicine, Professor of the subject of Transmission of Infectious Diseases by Insects, Professor of International Law as affecting Sanitary Regulations, Professor of Constitutional and Statutory Law as affecting Sanitary Regulations, and a Professor of the History of Preventive Medicine.

SECTION 8. The Faculty of the Department of Public Health shall have the charge and control, under the supervision of the President and Board of Trustees, of the educational work in said Department; it shall determine the qualifications of candidates for admission to the Department, the courses of study to be pursued, the examinations to be held, and the standing of students. Degrees will be conferred upon students upon the recommendation of the Faculty.

SECTION 9. There shall be kept in a bound book a complete record of the proceedings of the Faculty, which record shall be kept by the Registrar of the University.

SECTION 10. The Dean shall be the administrative officer of the educational work of said Department and shall prepare and present to the meetings of the Faculty such matters and business as should come before the Faculty; he shall make requisitions in writing for all supplies required, and forward the same to the President for approval; he shall carry out the directions

of the Faculty in all matters within its jurisdiction, and he shall make an annual report in writing to the President, setting forth in detail the work done during the year, and the general needs of the Department for the ensuing year.

SECTION 11. No supplies or equipment shall be purchased for the Department herein named except upon a written requisition approved by the President.

SECTION 12. The Dean, instructors, lecturers, and members of the teaching force shall be elected, and the terms of service and the salaries of each shall from time to time be determined by the Board of Trustees.

SECTION 13. Students in this Department shall be charged a tuition fee of one hundred dollars per annum, together with the usual matriculation and library fees. Any student not qualified to enter for either degree may, upon approval by the Dean, be admitted as a special student upon the payment of the regular tuition and other fees and a certificate of attainment given setting forth the work completed by such students in the course,

SECTION 14. The Executive Committee of the Board of Trustees is hereby authorized to do and perform such acts as are required in this ordinance to be done by the Board of Trustees between the regular meetings of the Board of Trustees, and to report its proceedings in accordance with article 6, section 4, of the By-Laws.

SECTION 15. This ordinance shall not go into effect until pledges for an endowment have been secured for the full amount of two hundred thousand dollars, or a subscribed guarantee fund extending over a period of five years, which will produce ten thousand dollars per annum for said period. The Executive Committee shall determine and by resolution declare when pledges as above required have been secured, and upon such declaration this ordinance shall go into effect.

## ADMINISTRATION.

The conduct of the Department of Public Health will be in charge of General George M. Sternberg, M. D., LL. D., as Dean, and the following gentlemen, among others, will be invited to take positions as professors and lecturers :

*Hygiene*.—GEORGE M. STERNBERG, M. D., LL. D. (Surgeon General U. S. A., Retired).

Ex-President of the American Medical Association, American Public Health Association, and the Association of Military Surgeons of the United States ; Member of the Association of American Physicians ; Fellow of the American Association for the Advancement of Science ; Honorary Member of the Epidemiological Society of London, of the Royal Academy of Medicine of Rome, of the Academy of Medicine of Rio de Janeiro, of the Société Française d'Hygiène, of the American Academy of Medicine, etc.

*Sanitary Chemistry*.—HARVEY W. WILEY, A. M., M. D., S. B., Ph. D., LL. D.

Chief of the Bureau of Chemistry, U. S. Department of Agriculture ; Member of the American Association for the Advancement of Science, American Chemical Society, German Chemical Society, Society of Medical Jurisprudence of New York, American Pharmaceutical Association, American Public Health Association, and Honorary Member of Franklin Institute of Philadelphia, etc.

*Bacteriology*.—JAMES CARROLL, M. D.

Assistant Surgeon U. S. Army ; Curator Army Medical Museum ; Member of the Society of American Bacteriologists ; Associate Professor of Bacteriology and Pathology and Instructor in Clinical Microscopy, Medical Department of Columbian University.

*Medical Zoölogy*.—CHARLES WARDELL STILES, A. M., Ph. D.

Zoölogist United States Bureau of Public Health and Marine Hospital Service ; Honorary Custodian of the Helminthological Collection, United States National Museum ; Correspondent Etanger de l'Académie de Médecine (Paris) ; Professor of Medical Zoölogy in the School of Medicine, Georgetown University ; Special Lecturer on Animal Parasites at the Army Medical School and the Medical Department of Johns Hopkins University.

*Sanitary Administration.*—WILLIAM C. WOODWARD, M. D.,  
LL. M.

Health Officer of the District of Columbia; Professor of State Medicine, School of Medicine, Georgetown University; Professor of Medical Jurisprudence, Medical Department, Columbian University; Member of the American Medical Association; Member of the American Public Health Association.

*Sanitary Inspection Service.*—WALTER WYMAN, A. M., M. D.,  
LL. D.

Surgeon General U. S. Public Health and Marine Hospital Service; Member Board of Visitors, Government Hospital for the Insane; Member Medical Board of Providence Hospital; Member of the American Medical Association, Association of Military Surgeons, American Public Health Association; Honorary Member Imperial Society of Medicine of Constantinople; Member of the American Academy of Science, Society of Psychical Research, American Climatological Association, etc.

*Dangerous Occupations.*—CHARLES E. MUNROE, S. B., Ph. D.  
S. B. (*summa cum laude*), Harvard University, 1871; Ph. D., Columbian University, 1894; Assistant in Chemistry, Harvard University, 1871-1874; Professor of Chemistry, United States Naval Academy, 1874-1886; Chemist to Torpedo Corps, U. S. Naval Torpedo Station and War College, 1886-1892; Dean Corcoran Scientific School, Columbian University, 1892-1898; Dean School of Graduate Studies, Columbian University, 1892-1903; Professor of Chemistry, Columbian University, 1892 —; Vice-President American Association for the Advancement of Science, 1888; President Washington Chemical Society, 1896; President American Chemical Society, 1898; Expert Special Agent of the Twelfth U. S. Census in charge of the Chemical Industries of the United States, 1900-1902; Fellow of the Chemical Society of London, the German Chemical Society, the Society of Chemical Industries, the U. S. Naval Institute, the American Institute of Mining Engineers, etc.

*Comparative Medicine.*—DANIEL E. SALMON, D. V. M.

Chief of the Bureau of Animal Industry; Member of American Veterinary Medical Association, American Public Health Association; Fellow of American Association for the Advancement of Science; Corresponding Member of the Central Veterinary Medical Society of France; Honorary Associate of the Royal College of Veterinary Surgeons of Great Britain; Honorary Member of the Royal Agricultural Society of England; Honorary Member of the Epidemiological Society of London.

*Insects as Agents in the Transmission of Infectious Diseases.—*

L. O. HOWARD, Ph. D.

Chief Entomologist U. S. Department of Agriculture; Permanent Secretary of the American Association for the Advancement of Science; Curator of the Department of Insects, U. S. National Museum, etc.

*International Law.—*DAVID J. BREWER, LL. D.

Associate Justice of the Supreme Court of the United States; Professor of International Law in the Department of Jurisprudence and Diplomacy, Columbian University.

*Constitutional and Statutory Law.—*HENRY ST. GEORGE TUCKER, LL. D.

Dean of the Departments of Law, Jurisprudence and Diplomacy, Columbian University; Professor of Comparative Constitutional Law; Editor of "Tucker on the Constitution."

*Administrative Law.—*GEORGE WINFIELD SCOTT. Ph. D., LL. B.

Professor of Administrative Law in the Department of Jurisprudence and Diplomacy, Columbian University.

## COLUMBIAN UNIVERSITY.

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### ORDINANCE

#### PROVIDING FOR THE CONDUCT OF THE DEPARTMENTS OF MEDICINE AND DENTISTRY AND THE UNIVERSITY HOSPITAL.

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It is hereby ordained by the Board of Trustees of Columbian University :

#### DEPARTMENT OF MEDICINE.

SECTION 1. *General and Executive Faculty.*—There shall be in the Department of Medicine a General Faculty, consisting of the President of the University, the Dean of the Department of Medicine, the professors, adjunct professors, assistant professors, and instructors, which Faculty shall meet once or twice a year, upon the call of the President, for the purpose of consultation and conference. There shall also be an Executive Faculty which shall have the powers hereinafter set forth.

SECTION 2. The Executive Faculty of the Department of Medicine shall consist of the President of the University, the Dean of the Department of Medicine, and the following professors: a Professor of the Practice of Surgery, a Professor of Obstetrics, a Professor of Gynecology, a Professor of Anatomy, a Professor of Physiology, a Professor of the Theory and Practice of Medicine, a Professor of Materia Medica and Therapeutics, a Professor of Hygiene, a Professor of Chemistry and Toxicology, a Professor of Pathology, and a Professor of Bacteriology. The Dean and members of the General and the Executive Faculties and all instructors, demonstrators, and members of the teaching force shall be elected, and the

terms of service and the salaries of each shall, from time to time, be determined by the Board of Trustees.

SECTION 3. The Executive Faculty of the Department of Medicine shall have charge and control, under the general supervision of the President and the Board of Trustees, of the educational work in the Department of Medicine. It shall determine the qualifications of candidates for admission to the Department, the courses of study to be pursued, the examinations to be held, and the standing of students. Degrees will be conferred upon students upon the recommendation of said Faculty. The Executive Faculty shall make all assignments to the Hospital and Dispensary staff, except as hereinafter provided, and the Hospital shall always be open and free to inspection and use for educational purposes by each member of the Executive Faculty.

SECTION 4. There shall be kept in a bound book a complete record of the proceedings of the Executive Faculty at its meetings, such record to be in the possession of the Registrar of the University, and for this purpose the Registrar shall attend the meetings of the Executive Faculty and keep the minutes. All previous records shall be kept in the custody of the Registrar. There shall be monthly meetings of the Executive Faculty during the school year at such time and upon such day as shall be fixed by said Faculty. Special meetings may be called by the President at any time.

SECTION 5. The Dean shall be the administrative officer of the educational work in the Department of Medicine, and shall prepare and present to the meetings of the Executive Faculty at stated and special meetings and to the General Faculty meetings such business within his knowledge as should come before the said Faculties, respectively; he shall make requisitions in writing for all supplies required, and forward the same to the President for approval; he shall carry out the directions of the Executive Faculty in all matters within its jurisdiction, and he shall make an annual report in writing to the President, setting forth in detail the work done during the year and the general needs of the Department for the ensuing year.

## DEPARTMENT OF DENTISTRY.

SECTION 6. *Executive Faculty.*—The Executive Faculty of the Department of Dentistry shall be composed of the President of the University, the Dean of the Department of Dentistry, a Professor of Dental Prosthetics, a Professor of Operative Dentistry, a Professor of Anatomy, a Professor of Chemistry, a Professor of Physiology, a Professor of Materia Medica and Therapeutics, a Professor of Bacteriology, a Professor of Prosthetic Technique, and a Professor of Operative Technique. The Executive Faculty shall have charge, under the general direction of the President and the Board of Trustees of the University, of the educational work of the Department of Dentistry. It shall determine the qualifications of applicants for admission to the Department, prescribe the courses of study, and recommend to the Board candidates for degrees.

SECTION 7. The Dean and the members of the Executive Faculty of the Department of Dentistry, together with all instructors and administrative officers, shall be appointed by the Board of Trustees, and their terms of service and salaries shall be fixed by the Board of Trustees.

SECTION 8. There shall be kept in a bound book a complete record of the proceedings of the Executive Faculty at its meetings, such record to be in the possession of the Registrar of the University, and for this purpose the Registrar shall attend the meetings of the Faculty and keep the minutes. All former records of the Executive Faculty shall be kept in the custody of the Registrar. There shall be monthly meetings of the Executive Faculty during the school year at such time and upon such days as shall be fixed by said Faculty.

SECTION 9. The Dean shall be the administrative officer of the educational work of the Department and shall prepare and present to the Executive Faculty at its stated and special meetings such business within his knowledge as should come before said Faculty, and he shall carry out the directions of the Executive Faculty in all matters within its jurisdiction. He shall sign all requisitions for supplies and forward the same to

the President for his approval, and make an annual report in writing to the President stating the work and needs of the Department.

#### THE HOSPITAL.

SECTION 10. The Hospital of the University shall be under the direct control and management of the President and Board of Trustees of the University. It shall be the duty of all concerned to see that the Hospital is used to the highest degree possible for educational purposes as a part of the medical educational work of the University, and to this end the Executive Faculty of the Department of Medicine is requested to make regular reports and recommendations to the Board of Trustees upon any and all matters affecting the conduct and management of the Hospital.

SECTION 11. There shall be maintained in the Hospital a School for Nurses, of which the Superintendent of Nurses of the Hospital shall be the Principal. Pupil nurses shall be taught the art and duties of nursing, the selection and preparation of foods for the sick, the purchasing of supplies, the general management of the household affairs of the Hospital, and such further instruction as shall be approved by the Board of Trustees. Certificates of attainment may be given to graduate nurses for work done in the School for Nurses. The work in this school shall be under the general supervision of the President and the Board of Trustees.

SECTION 12. *The Superintendent.*—There shall be a Superintendent of the Hospital appointed by the Board of Trustees, who shall be the executive officer and shall have the charge of the hospital under the general direction of the President and Board of Trustees. He shall make the business arrangements for patients coming into the Hospital, in accordance with the schedule of charges approved by the Board of Trustees, and so far as possible he shall provide that cases may be commented upon or used in the educational work. He shall collect and account to the Treasurer for all moneys charged for the rent of rooms, operating tables, the services of nurses, and fees of

all descriptions in the Hospital as fixed by the Board of Trustees of the University; he shall visit the wards daily, see that the Hospital is properly cared for and kept in a good sanitary condition, and that proper attention is given to patients by employees of the Hospital.

SECTION 13. *Superintendent of Nurses.*—There shall be a Superintendent of Nurses, who shall be appointed by the Board of Trustees, whose duty it shall be to superintend the nursing in the Hospital. She shall be the Principal of the School for Nurses and shall direct the educational work of the school for Nurses, the courses of lectures to be approved by the Executive Faculty of the Department of Medicine. She shall visit the wards daily and make monthly reports to the President, stating the names of patients in the various rooms and wards of the Hospital, with the name of the physician in charge and the length of time such patient or patients have occupied a room or ward respectively, and such further facts as she may be called upon for by the President.

SECTION 14. *The Dietician.*—There shall be a Dietician in the Hospital, who shall have charge of the purchase of household supplies, employment of servants and maids in care of rooms throughout the Hospital. She shall have charge of and be responsible for the linen, china, glass and silverware, and supervise the laundry and general housekeeping in the Hospital. She shall have charge of the diet kitchen and shall be the teacher of nurses in the conduct of household affairs, the purchase and inspection of supplies, management of servants, and the cooking of foods for the sick. For this purpose nurses in full course shall be required to take such instruction, and probationers may take this work as preparatory to the regular course. In the matter of teaching the nurses, the Dietician shall be under the general direction and supervision of the Principal in charge of the Nurses' School. In all matters pertaining to the conduct of the housekeeping, purchase of supplies, employment of servants, etc., said Dietician shall be under the general direction of the Superintendent of the Hospital. She shall examine and certify to the correctness of all

bills for household supplies each month, and on or before the roth of each month shall render the accounts therefor to the Superintendent for the special committee in charge of such accounts. She shall from time to time make such reports to the President of the University as may be called for by him.

SECTION 15. *Resident Physicians, etc.*—The resident physicians of the Hospital, interns and externs, shall be appointed by the Board of Trustees, and they shall be under the immediate direction of the Superintendent of the Hospital. Such appointments, excepting such appointees as are members of the Executive Faculty, shall be made upon the recommendation of the Executive Faculty of the Department of Medicine. Members of the Executive Faculty may be assigned by the Board of Trustees to such special work in the Hospital as may be agreed upon between the Board of Trustees and the member so assigned.

SECTION 16. *Board of Lady Managers.*—There shall be a Board of Lady Managers of the Hospital that shall be a Board of Visitors, with power to raise money for the maintenance of the Hospital, and with such powers and duties in connection with the purchase of supplies and equipment as shall be assigned them by the President. They shall make weekly examinations and reports upon the general management of the Hospital, such reports to be made to the President and Board of Trustees of the University, and they shall perform such other duties in connection with the Hospital as may be especially assigned by the President and the Board of Trustees.

SECTION 17. The general care of the buildings occupied by the Hospital and Department of Medicine, the appointment of janitors and workmen therein, shall be under the charge of the Assistant Treasurer of the University, subject to the general control of the President and the Board of Trustees.

SECTION 18. No supplies or equipment shall be purchased for the Departments herein named, or the Hospital, by the Deans or the Superintendents, except upon written requisitions approved by the President, excepting in the case of table supplies and emergency medical supplies for the Hospital, and in no

case shall the amount of the purchase exceed the amount stated in the approved requisition.

SECTION 19. The Executive Committee of the Board of Trustees is hereby authorized to do and perform such acts as are required in this ordinance to be done by the Board of Trustees, between the regular meetings of the Board of Trustees, and to report its proceedings in accordance with Article 6, Section 4, of the By-Laws.

SECTION 20. All acts or parts of acts or rules inconsistent with these articles are hereby repealed.

Adopted February 20, 1904.